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U.S. GRAIN MARKETING SYSTEM FOR THE 1990s:

ALTERNATIVE POLICY SCENARIOS

By

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PREFACE

This report fulfills part of the objectives undertaken by the Southern Regional Research Project S-115, entitled, "Alternative Structure for Increasing Efficiency in Intra- and Inter-Regional Grain Marketing Systems." The work was initiated by a modeling subcommittee whose members include Lowell D. Hill, University of Illinois; Joe W. Free, Tennessee Valley Authority; Harry Hall, University of Kentucky; Travis Phillips and Lanny Batemen, Mississippi State University; and Dean Baldwin, The Ohio State University.

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INTRODUCTION

The grain and oil seed production, utilization, market structure and flow data, which were presented in several papers at this conference, were also used to analyze the impact of U.S. policy and technological changes on the U.S. grain marketing system.[1/] Changes in U.S. policy or technologies influence the market structure of the grain industry, alter the demand for transportation services and modify the volume and directional flow of grain through the marketing chanrels. It is the purpose of this paper to analyze the impact of these hypothesized changes on the U.S. grain marketing system in order to improve public and private decision making and to improve the performance of the grain industry.

To analyze the impact of policy changes and technologies on the U.S. grain marketing system, grain marketing regions and export points located on the Great Lakes, the Gulf Coast and on the Atlantic and Pacific oceans were identified (Figure 1). The criteria used to identify each marketing region within a state or for a group of states were types of grain produced, volume of grain produced, historic grain flow patterns, transportation modes available and number and type of elevators and processing firms.

Market structure data from a 1970 grain industry survey identified number and types of elevators and manufacturing firms per region [1]. Grain flow data from the 1970 and 1977 grain industry surveys identified probable grain flow patterns and routes [9]. One location, a city or town, in each region was identified as a transportation point. Personnel from the Tennessee Valley Authority used the transportation route and point data to calculate

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[1/] In this paper grain is defined to include corn, wheat and soybeans.

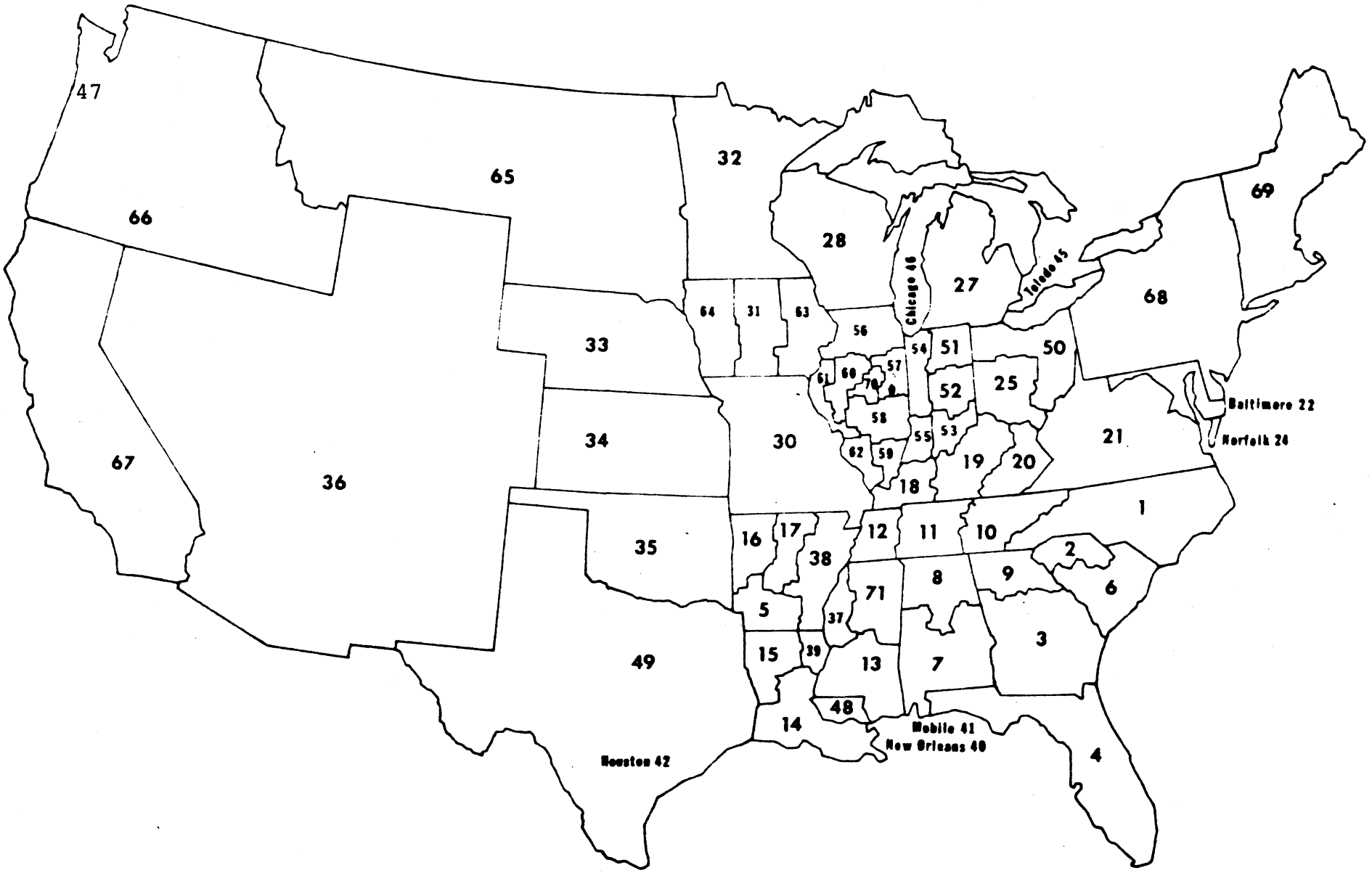

Figure 1. Map of S-115 Areas. Numbers Are Market Areas Used in S-115 Study

grain rail, truck and/or barge transport rates among the marketing regions and to export points [4].

The above data were incorporated into a linear programming model to analyze the impact of selected policy changes on the U.S. grain marketing system. The L.P. model, like all of its predecessors, is solved within the theoretical framework of perfectly competitive markets.[2/] The objective function minimizes the total cost of assembling, storing, processing and transporting grain by six transportation options from 59 origins to 59 destinations[3/] and to eight export points for three commodities (corn, wheat, and soybeans) in two time periods.[4/] (Figure 2). In the model, different transportation options, single rail car, three car, ten car, unit train, truck and barge, and combinations of these options transport grain among the regions and to the export points. The model contains one representative farm storage firm per region, four different elevator types per region, three different feed manufacturers or feed mills per region, and one corn processor, wheat miller and soybean processor per region.[5/] Each of these firms can store grain during the two time periods and can transport grain to other firms and to other regions. Since the storage capacity per region and the supply of transportation services are not constrained, grain movements between time

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[2/] The concept of perfect markets is discussed by Sosnick, S.H., "Toward a Concrete Concept of Effective Competition." American Journal of Agricultural Economics, Vol. I. No. 4, (November 1968) p. 827-853.

[3/] In this analysis each origin can be a destination and each destination can be an origin. Because grain does not flow from traditional grain deficit areas to grain surplus areas, transportation routes and rates were not specified for all options [4].

[4/] Time period 1 includes the wheat, corn and soybean harvest (July to December) while time period 2 includes the winter livestock feeding period (December to June).

[5/] The firm types were specified by representatives from the S-115 committee and from secondary sources. Although only four elevator types exist per region, for example, the firms' characteristics may be unique among regions. Definitions for the firm types are listed in a regional publication [1].

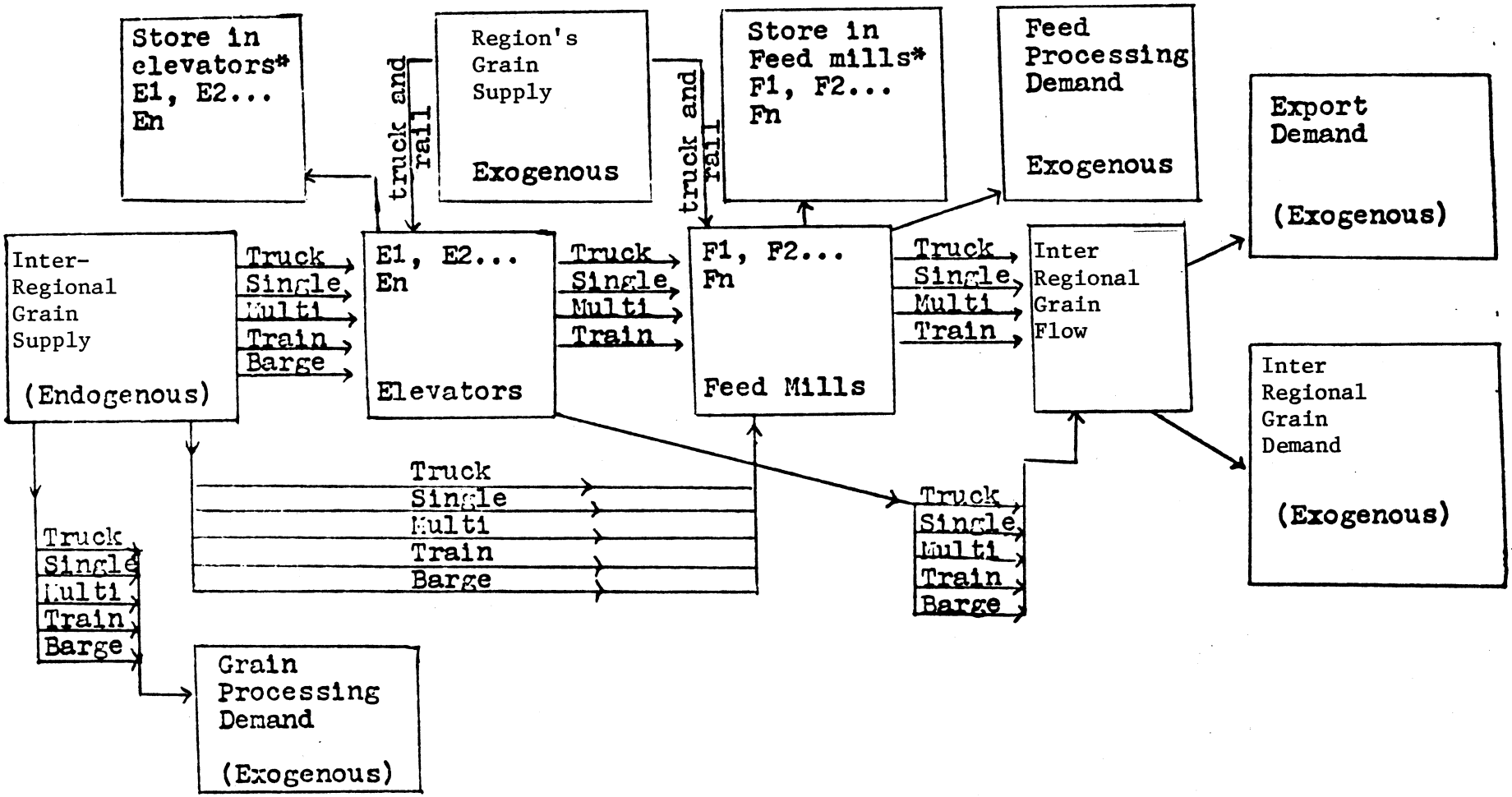

Figure 2. Activities and Constraints of The National Grain Linear Programming Model for one time period and for one region.

periods and across regions are limited by the respective market regions' surpluses and disappearances.[6/]

Grain production, disappearance and surpluses or deficits for each region are identified from the grain projection analysis presented at this conference and from secondary sources [3, 6]. If disappearance of a grain in a region exceeds the production of that grain, the marketing region is defined as a deficit area. In contrast, when the production of a grain exceeds its disappearance, the marketing region is defined as a surplus area. The grain deficits or surpluses for each respective region are constrained in the model and firms endogenously ship grain from surplus regions to deficit areas and to export points. Exports are also constrained in the model and are allocated among ports based on historic percentage shares [5, 7 and 8]. Movements of grain among surplus and deficit regions and export points are endogenously determined by transportation, assembly and storage costs.

Since economic activities such as drying of grain and the movement of grain within a region to meet local disappearance are not directly influenced by the national grain market, these activities are not included in the analysis. The specific details and assumptions underlying the model are described in a forthcoming Southern Regional Research Bulletin entitled, "Mathematical Specifications and an L.P. Matrix Generator for Grain Marketing Models" [2].

Alternative Policy Scenarios

By modifying the constraints or right hand sides (RHS) within the L.P. model, the following eight alternative policy scenarios are analyzed: The USDA National Inter-Regional Agricultural Projections (NIRAP) for 1985, 1990

[6/] In future analyses, these assumptions will be deleted.

and 2000 represent scenarios (1), (2) and (3).[7/] The next two scenarios are: (4) A 1990 "high grain production-disappearance" estimate (high grain) and (5) a "moderate 1990 grain production-disappearance" (baseline) estimate. The remaining three policy scenarios are evaluated as alternative moderate "baseline" estimates. These include: (6) a relative increase in the volume of grain exports for the baseline estimate (export scenario), (7) a relative increase in the volume of stored grain (storage scenario) and (8) the opening of three super export points, one on the east coast, the west coast, and the Gulf coast (super port scenario).[8/]

The assumptions and procedures, which underlies the three NIRAP projections (scenarios 1, 2, and 3), are defined in a paper presented at this conference [6]. Because these assumptions are conservative, the current U.S. grain production levels nearly equal the USDA 1985 and 1990 production projections [11]. Thus, two alternative 1990 production-disappearance production estimates, the high grain (scenario 4) and the baseline (scenario 5) were also examined. The high grain scenario as the name implies estimates that grain production in 1990 increases significantly, exceeding the 1979 grain production level by two and one-half times. The baseline scenario on the other hand estimates 1990 grain production levels that exceed the USDA projections but are less than the high grain estimates.

Because the baseline estimates reflect moderate grain production levels, relative to the NIRAP projections and the high grain estimates, scenarios 6, 7, and 8 were examined in terms of the baseline production-disappearance

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[7/] Hereafter, 1985 specifies 1984 grain production and 1985 disappearance, 1990 specifies 1989 grain production and 1990 disappearance, and 2000 refers to 1999 production and 2000 disappearance.

[8/] A super port is defined as a port which has the capacity to load vessels with 100,000 tons or more capacity. In this option, ports such as the Great Lakes which cannot handle vessels of that size are closed.

assumptions. For scenario 6, it was assumed that the domestic grain disappearance in each region would decrease by 50 percent relative to the level in the baseline estimate while grain production would equal the baseline estimate. Thus, exports would significantly increase for the export scenario relative to the baseline scenario. For scenario 7, it was assumed that the volume of grain stored in the U.S. would increase if exports decreased by 50 percent and if domestic grain production and disappearance levels were unchanged.

For the eighth scenario, three super ports were opened and replace the export activities of the ports located on the Great Lakes, the East Coast and the West Coast. A super port is defined in this analysis as a port which has the capacity to load vessels with 100,000 tons or more capacities. The baseline production, disappearance and export estimates were used for this scenario; however, all grain previously exported via smaller ports located on the Gulf Coast moved through one Gulf super port located at New Orleans; all grain previously moving through the Great Lakes and East Coast ports exited via a super port located at Norfolk and all grain previously exported via the West Coast exited the country via a super port in Portland.

To analyze the outcomes for all eight scenarios, the production-disappearance data were allocated to the marketing regions and export points depicted in Figure 1 and the model was solved. Although the L.P. Model reports output for all marketing regions and export points, (Figure 1) the results for the marketing regions were aggregated into eleven production regions in order to effectively discuss and analyze each scenario in the remainder of this paper (Figure 3). Thus, the following analysis will highlight data for eleven production regions and eight export points.

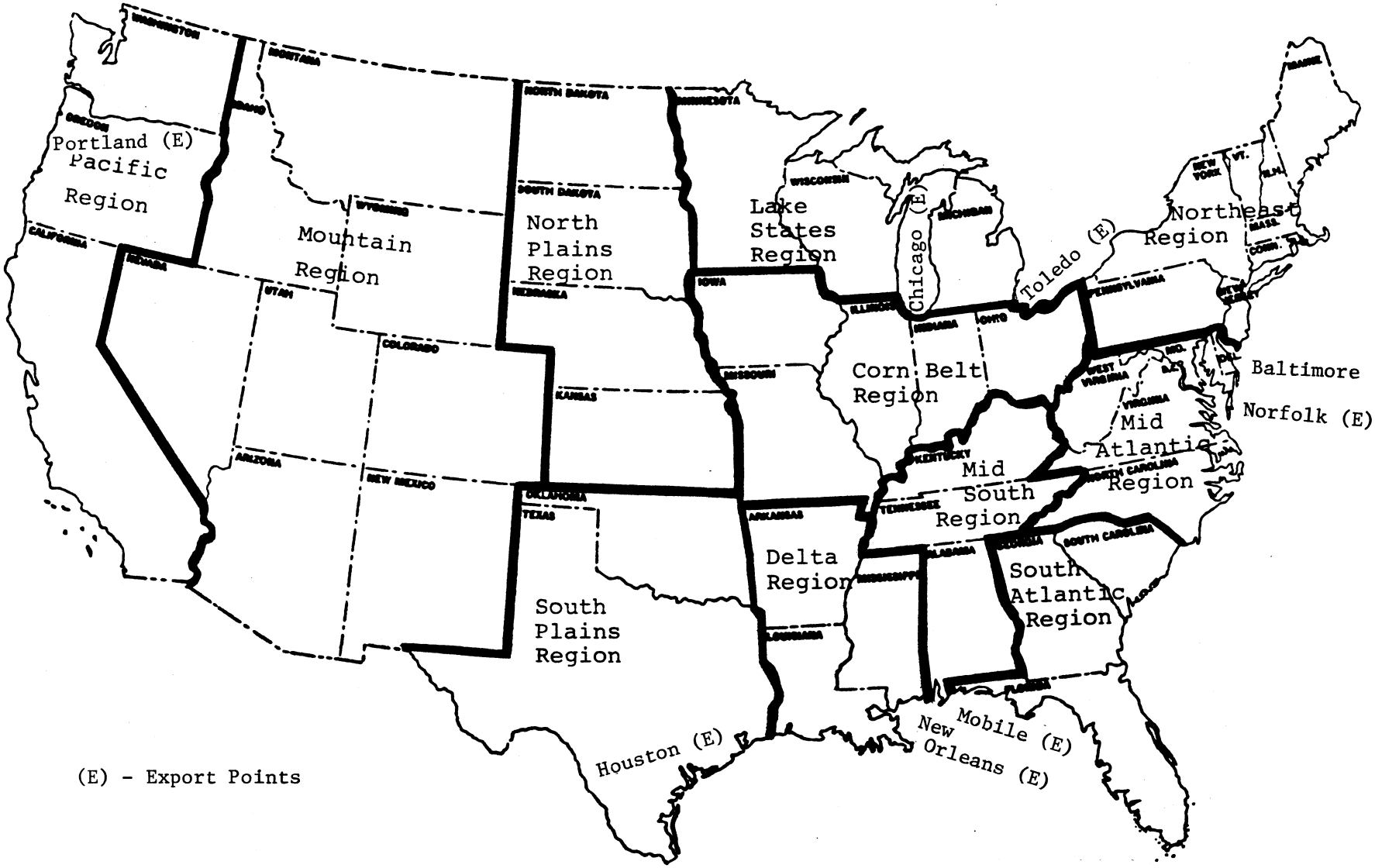

Figure 3. Eleven Production Regions and Eight Export Points

All outcomes reported in this paper represent what "could be" the outcomes for the eight scenarios rather than what "will be" the future outcomes. An obvious strength of this analysis is that the model can be solved to accommodate alternative sets of assumptions, scenarios and input data. The remainder of this paper presents the assumptions and exogenous data for all eight scenarios and evaluates the model's results for each scenario.

USDA-NIRAP Projections

Conservative production levels and economic changes are the underpinnings for the NIRAP projections [9]. The U.S. and regional grain production-disappearance projections were exogenously allocated to the marketing regions depicted in Figure 1 and carryover was endogenously determined by the L.P. model as the difference between total regional grain surpluses and deficits. Based on these projections, corn production is projected to increase from 7.1 billion bushels in 1978 to 9.0 billion in 1999, a 28 percent increase (Table 1). Soybean production is projected to increased from 1.8 billion bushels to 3.0 billion in the same period, a 65 percent increase (Table 2). Wheat production is projected to increase from 1.8 billion bushels in 1978 to 2.9 billion in 1999, a 61 percent increase (Table 3). Total grain production in the U.S. is projected to increase from 10.7 billion bushels in 1978 to 15 billion bushels in 1999, a 40 percent increase over the 1978 production level (Table 4).

A portion of this grain will be consumed on the farm or in the region in which it was produced. This locally consumed grain is not traded in the national market and is not included in the national grain model. Based on this assumption, 3.4 billion bushels of surplus corn are available in the national market in 1985 while 5.3 billion bushels are available in 2000 (Table 5). About 1.4 billion bushels and 2.4 billion bushels of surplus soybeans and 1.3 billion bushels and 2.1 billion bushels of surplus wheat are available in the national market in 1985 and 2000, respectively (Table 6 and 7). By

Table 1. Corn Production for 1978 and USDA Projections for 1984, 1989, and 1999 and Two Alternative Production Estimates for 1989 for the U.S. and Eleven Production Regions

	U.S.D.A. PROJECTIONS[1]				Alternative Estimates 1989	
	(000,000 Bu.)					
Regions	1978	1984	1989	1999	High[2]	Baseline[3]
North East Region	169.1	154.0	173.3	206.4	285.0	210.0
Percentage Change (1978 = 100)	100	91	102	122	169	124
Mid-Atlantic Region	250.5	259.4	286.2	330.2	475.5	350.5
Percentage Change (1978 = 100)	100	104	114	132	190	140
South Atlantic Region	124.5	161.0	177.1	205.4	296.5	218.5
Percentage Change (1978 = 100)	100	129	142	165	238	176
Mid-South Region	190.6	204.4	222.9	256.1	373.8	275.5
Percentage Change (1978 = 100)	100	107	117	134	196	145
Delta Region	12.1	10.2	9.2	7.8	32.2	23.8
Percentage Change (1978 = 100)	100	84	76	64	266	197
Corn Belt Region	3861.2	3802.1	4110.0	4673.0	6818.1	5025.3
Percentage Change (1978 = 100)	100	98	106	121	177	130
Lake States Region	1095.5	1025.9	1110.9	1247.9	1830.4	1349.1
Percentage Change (1978 = 100)	100	94	101	114	167	123
North Plains Region	1084.7	1194.6	1371.4	1741.8	2268.6	1672.1
Percentage Change (1978 = 100)	100	110	126	161	209	154
South Plains Region	148.7	154.6	173.1	206.0	283.6	209.0
Percentage Change (1978 = 100)	100	104	116	139	191	141
Pacific Region	44.5	48.8	59.0	72.6	99.1	73.0
Percentage Change (1978 = 100)	100	110	133	163	223	164
Mountain Region	100.5	70.2	80.2	96.7	126.4	93.2
Percentage Change (1978 = 100)	100	70	80	96	126	93
U.S. Total	7081.9	7085.2	7773.3	9043.9	12889.2	9500.0
Percentage Change (1978 = 100)	100	100	110	128	182	134

[1] National Inter-Regional Agricultural Projections (NIRAP) System, Hill and Leath [5,7,8 and 9].

[2] Percentage change in U.S. production between 1969 and 1979 extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares published by Hill and Leath [5,7 and 8].

[3] Average annual percentage change in U.S. production for the 1969 to 1979 period extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares as published by Hill and Leath [5,7, and 8].

Table 2. Soybean Production for 1978 and USDA Projections for 1984, 1989, and 1999 and Two Alternative Production Estimates for 1989 for the U.S. and Eleven Production Regions

	U.S.D.A. PROJECTIONS[1]				Alternative Estimates 1989	
	(000,000 Bu.)					
Regions	1978	1984	1989	1999	High[2]	Baseline[3]
North East Region	8.6	5.3	6.8	9.9	13.0	11.1
Percentage Change (1978 = 100)	100	62	79	115	151	129
Mid-Atlantic Region	67.6	73.9	92.9	126.0	177.5	152.6
Percentage Change (1978 = 100)	100	109	137	186	263	226
South Atlantic Region	71.3	100.6	134.5	197.4	226.8	194.9
Percentage Change (1978 = 100)	100	141	189	277	318	273
Mid-South Region	142.1	172.9	201.8	257.1	385.3	331.1
Percentage Change (1978 = 100)	100	122	142	181	271	233
Delta Region	265.5	303.0	357.2	459.6	680.4	645.7
Percentage Change (1978 = 100)	100	114	135	173	256	243
Corn Belt Region	1009.4	1137.9	1325.3	1674.6	2517.5	2049.0
Percentage Change (1978 = 100)	100	113	131	166	249	203
Lake States Region	168.2	134.7	139.5	147.2	267.6	230.0
Percentage Change (1978 = 100)	100	80	83	88	159	137
North Plains Region	85.3	84.7	98.8	125.5	190.5	163.7
Percentage Change (1978 = 100)	100	99	116	147	223	192
South Plains	24.7	19.7	25.0	35.6	45.4	39.0
Percentage Change (1978 = 100)	100	80	101	144	184	158
U.S. Total	1842.7	2032.7	2381.8	3032.9	4504.0	3817.1
Percentage Change (1978 = 100)	100	110	129	165	244	207

[1] National Inter-Regional Agricultural Projections NIRAP) System, Hill and Leath [5,7,8 and 9].

[2] Percentage change in U.S. production between 1969 and 1979 extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares published by Hill and Leath [5,7 and 8].

[3] Average annual percentage change in U.S. production for the 1969 to 1979 period extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares as published by Hill and Leath [5,7, and 8].

Table 3. Wheat Production for 1978 and USDA Projections for 1984, 1989, and 1999 and Two Alternative Production Estimates for 1989 for the U.S. and Eleven Production Regions

	U.S.D.A. PROJECTIONS[1]				Alternative Estimates 1989	
	(000,000 Bu.)					
Regions	1978	1984	1989	1999	High[2]	Baseline[3]
North East Region	11.9	17.8	18.9	20.8	25.1	24.6
Percentage Change (1978 = 100)	100	150	159	175	211	207
Mid-Atlantic Region	16.7	26.0	31.1	38.2	41.5	40.6
Percentage Change (1978 = 100)	100	156	186	229	249	243
South Atlantic Region	6.8	10.2	12.0	15.5	13.9	13.7
Percentage Change (1978 = 100)	100	150	176	228	204	201
Mid-South Region	16.2	25.5	30.1	38.7	38.0	37.3
Percentage Change (1978 = 100)	100	157	186	239	235	230
Delta Region	13.7	23.1	26.7	33.0	35.8	35.1
Percentage Change (1978 = 100)	100	169	195	241	261	256
Corn Belt Region	141.3	230.1	235.0	247.1	311.6	305.5
Percentage Change (1978 = 100)	100	163	166	175	221	216
Lake States Region	112.8	161.1	179.8	222.1	237.8	233.1
Percentage Change (1978 = 100)	100	143	159	197	211	207
North Plains Region	739.7	858.8	958.1	1159.1	1264.0	1239.3
Percentage Change (1978 = 100)	100	116	130	157	171	168
South Plains Region	199.8	274.1	309.4	370.8	405.8	397.8
Percentage Change (1978 = 100)	100	137	155	186	203	199
Pacific Region	231.7	217.8	249.5	296.3	323.1	316.8
Percentage Change (1978 = 100)	100	94	108	128	139	137
Mountain Region	308.1	309.1	357.4	452.6	470.4	461.1
Percentage Change (1978 = 100)	100	100	116	147	153	150
U.S. Total	1798.7	2153.6	2408.0	2894.2	3167.0	3104.9
Percentage Change (1978 = 100)	100	120	134	161	176	173

[1] National Inter-Regional Agricultural Projections (NIRAP) System, Hill and Leath [5,7,8 and 9].

[2] Percentage change in U.S. production between 1969 and 1979 extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares published by Hill and Leath [5,7 and 8].

[3] Average annual percentage change in U.S. production for the 1969 to 1979 period extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares as published by Hill and Leath [5,7, and 8].

Table 4. Grain and Oilseed Production[1/] for 1978 and USDA Projections for 1984, 1989, and 1999 and Two Alternative Production Estimates for 1989 for the U.S. and Eleven Production Regions

	U.S.D.A. PROJECTIONS[2/]				Alternative Estimates 1989	
	(000,000 Bu.)					
Regions	1978	1984	1989	1999	High[3/]	Baseline[4/]
North East Region	189.6	177.1	199.0	237.1	323.1	245.7
Percentage Change (1978 = 100)	100	93	105	125	170	130
Mid-Atlantic Region	334.8	359.3	410.2	494.4	694.5	543.7
Percentage Change (1978 = 100)	100	107	123	148	207	162
South Atlantic Region	202.6	271.8	323.6	418.3	537.2	427.1
Percentage Change (1978 = 100)	100	134	160	206	265	211
Mid-South Region	348.9	402.8	454.8	551.9	797.1	643.9
Percentage Change (1978 = 100)	100	115	130	158	228	185
Delta Region	291.3	336.3	393.1	500.4	748.4	704.6
Percentage Change (1978 = 100)	100	115	135	172	257	242
Corn Belt Region	5011.9	5170.1	5670.3	6594.7	9647.2	7379.8
Percentage Change (1978 = 100)	100	103	113	132	192	147
Lake States Region	1376.5	1321.7	1430.2	1617.2	2335.8	1812.2
Percentage Change (1978 = 100)	100	96	104	117	170	132
North Plains Region	1909.7	2138.1	2428.3	3026.4	3723.1	3075.1
Percentage Change (1978 = 100)	100	112	127	158	195	161
South Plains Region	373.2	448.4	507.5	612.4	734.8	645.8
Percentage Change (1978 = 100)	100	120	136	164	197	173
Pacific Region	276.2	266.6	308.5	368.9	422.2	389.8
Percentage Change (1978 = 100)	100	97	112	134	153	141
Mountain Region	408.6	379.3	437.6	549.3	596.8	554.3
Percentage Change (1978 = 100)	100	93	107	134	146	136
U.S. Total	10723.3	11271.5	12563.1	14971.8	20560.2	16422.0
Percentage Change (1978 = 100)	100	105	117	140	192	153

[1/] Grain and Oilseeds include corn, wheat and soybeans.

[2/] National Inter-Regional Agricultural Projections (NIRAP) System, Hill and Leath [5,7,8 and 9].

[3/] Percentage change in U.S. production between 1969 and 1979 extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares published by Hill and Leath [5,7 and 8].

[4/] Average annual percentage change in U.S. production for the 1969 to 1979 period extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares as published by Hill and Leath [5,7, and 8].

Table 5. Corn Surpluses and Deficits[1/] For Eleven Grain Production Regions, Exports For Eight Export Points, and Storage For The U.S. For Three USDA Projections, For Two 1990 Alternative Estimates, Plus Three 1990 Policy Simulations.

	U.S.D.A. PROJECTIONS[2/]			ALTERNATIVE ESTIMATES 1990		POLICY SIMULATION 1990		
Regions	1985	1990	2000	High[3/]	Baseline[4/]	Export Policy[5/]	Storage Policy[5/]	Super Ports[6/]
	- - - - Billions of Bushels - - - -							
Surplus								
North East	-	-	.006	.02	-	.1	-	-
Mid-Atlantic	-	-	-	-	-	.08	-	-
South Atlantic	-	-	-	-	-	.06	-	-
Mid-South	-	-	-	.009	-	.1	-	-
Corn Belt	2.4	2.8	3.4	5.0	3.3	4.2	3.3	3.3
Lake States	.4	.4	.6	1.0	.5	.9	.5	.5
North Plains	.6	.9	1.3	1.6	1.1	1.4	1.1	1.1
South Plains	-	-	-	-	-	.01	-	-
Total[7/]	3.4	4.1	5.306	7.629	4.9	6.85	4.9	4.9
Deficit								
North East	.07	.04	-	.01	.07	-	.07	.07
Mid-Atlantic	.07	.05	.02	.09	.07	-	.07	.07
South Atlantic	.08	.06	.04	.2	.1	-	.1	.1
Delta	.1	.2	.2	-	.2	.08	.2	.2
Mid-South	.005	.04	.009	.1	.06	-	.06	.06
South Plains	.1	.1	.1	.2	.2	-	.2	.2
Mountain	.1	.1	.1	.2	.2	.05	.2	.2
Pacific	.2	.2	.2	.2	.3	.09	.3	.3
Total[7/]	.725	.79	.669	1.0	1.2	.22	1.2	1.2
Export								
Baltimore	.4	0.5	.673	1.3	.7	1.3	.4	-
Norfolk	.4	.4	.673	1.1	.6	1.1	.3	1.9
New Orlean	.8	.8	1.346	2.4	1.2	2.4	.7	.5
Mobile	.1	.1	.138	.3	.3	.3	.2	-
Houston	.1	.1	.269	.4	.2	.4	.1	-
Toledo	.2	.2	.269	.5	.3	.5	.1	-
Chicago	.2	.2	.269	.5	.3	.5	.1	-
West Coast	-	-	-	-	-	-	-	1.2
Total	2.2	2.3	3.637	6.5	3.6	6.5	1.9	3.6
Deficit and Export	2.925	3.09	4.306	7.5	4.8	6.7	3.1	4.8
Storage (Surplus-[Def & Ex])	.475	1.01	1.0	.129	.1	.13	1.8	.1

Table 5, cont'd

1/A region is defined as a surplus area if production within the region is greater than disappearance and a region is defined as a deficit area whenever the disappearance in an area is greater than production.

2/National Inter-Regional Agricultural Projections (NIRAP) System, Hill and Leath [5,7,8 and 9].

3/Percentage change in U.S. production between 1969 and 1979 extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares published by Hill and Leath [5,7, and 8].

4/Average annual percentage change in U.S. production for the 1969 to 1979 period extrapolated to 1989 U.S. production was allocated among states and regions based on percentage shares as published by Hill and Leath [5,7 and 8].

5/For these scenarios, the baseline production estimates (Table 1) are used but alternative disappearance are identified.

6/For this scenario, the baseline production estimates and disappearance are used but exports are allocated among three super ports.

7/Within each production region, one or more marketing areas (Figures 1 and 3) may be a surplus (deficit) area even though the region is defined as deficit (surplus).

Table 6. Soybean Surpluses and Deficits[1/] For Eight Grain Production Regions, Exports For Eight Export Points, and Storage For The U.S. For Three USDA Projections, For Two 1990 Alternative Estimates, Plus Three 1990 Policy Simulations.

	U.S.D.A. PROJECTIONS[2/]			ALTERNATIVE ESTIMATES 1990		POLICY SIMULATION 1990		
Regions	1985	1990	2000	High[3/]	Baseline[4/]	Export Policy[5/]	Storage Policy[5/]	Super Ports[6/]
Surplus	- - - - Billions of Bushels - - - -							
Mid-Atlantic	.05	.07	.09	.1	.1	.1	.1	.1
South Atlantic	.05	.08	.09	.1	.9	1.0	.9	.9
Delta	.2	.3	.38	.4	.3	.5	.3	.3
Mid-South	.07	.1	.19	.05	.006	.2	.006	.007
Corn Belt	.8	1.0	1.32	1.6	1.3	1.5	1.3	1.3
Lake States	.2	.1	.19	.2	.2	.2	.2	.2
North Plains	.05	.06	.07	.1	.1	.1	.1	.1
South Plains	.01	.02	.02	.03	.02	.03	.02	.02
Total[7/]	1.43	1.73	2.35	2.58	2.926	3.63	2.926	2.927
Total Deficit[7/ 8/]	-	-	-	-	-	-	-	-
Export								
Baltimore	.06	.08	.121	.14	.2	.4	.08	-
Norfolk	.04	.05	.072	.09	.09	.1	.05	.5
New Orleans	.6	.7	1.087	1.3	.7	1.0	.3	.7
Mobile	.01	.01	.024	.02	.03	.04	.01	-
Toledo	.08	.09	.121	.2	.2	.4	.08	-
Chicago	.02	.02	.085	.05	.05	.08	.03	-
West Coast	-	-	-	-	.3	.5	.2	.3
Total	.81	.95	1.51	1.8	1.57	2.52	.75	1.5
Deficit and Exports	.81	.95	1.51	1.8	1.57	2.52	.75	1.5
Storage (Surplus-[Def & Ex])	.62	.78	.84	.78	1.356	1.11	2.176	1.427

Table 6, cont'd

1/A region is defined as a surplus area if production within the region is greater than disappearance and a region is defined as a deficit area whenever the disappearance in an area is greater than production.

2/National Inter-Regional Agricultural Projections (NIRAP) System, Hill and Leath [5,7,8 and 9].

3/Percentage change in U.S. production between 1969 and 1979 extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares published by Hill and Leath [5,7, and 8].

4/Average annual percentage change in U.S. production for the 1969 to 1979 period extrapolated to 1989 U.S. production was allocated among states and regions based on percentage shares as published by Hill and Leath [5,7 and 8].

5/For these scenarios, the baseline production estimates (Table 1) are used but alternative disappearance are identified.

6/For this scenario, the baseline production estimates and disappearance are used but exports are allocated among three super ports.

7/Within each production region, one or more marketing areas (Figures 1 and 3) may be a surplus (deficit) area even though the region is defined as deficit (surplus).

8/Although some marketing regions as depicted in Figures 1 and 3 have deficit production, all marketing areas summed together into a production region become surplus producing regions.

Table 7. Wheat Surpluses and Deficits[1/] For Eleven Grain Production Regions, Exports For Eight Export Points, and Storage For The U.S. For Three USDA Projections, For Two 1990 Alternative Estimates, Plus Three 1990 Policy Simulations.

	U.S.D.A. PROJECTIONS[2/]			ALTERNATIVE ESTIMATES 1990		POLICY SIMULATION 1990		
Regions	1985	1990	2000	High[3/]	Baseline[4/]	Export Policy[5/]	Storage Policy[5/]	Super Ports[6/]
	- - - - Billions of Bushels - - - -							
Surplus								
Mid-Atlantic	-	-	-	-	-	.007	-	-
South Atlantic	-	-	-	-	-	.004	-	-
Delta	.019	.02	.03	.03	.03	.03	.03	.03
Mid-South	-	-	.006	.009	.00	.02	.00	.005
Corn Belt	.03	.04	.05	.2	.2	.2	.2	.2
Lake States	.07	.09	.2	.2	.1	.2	.1	.1
North Plains	1.0	1.2	1.5	1.3	1.3	1.4	1.3	1.3
South Plains	.21	.24	.3	.4	.3	.4	.3	.3
Mountain	-	-	-	.1	.1	.1	.1	.1
Pacific	-	.01	.03	.3	.3	.3	.3	.3
Total[7/]	1.329	1.6	2.116	2.539	2.33	2.661	2.33	2.335
Deficit								
North East	.08	.08	.08	.06	.07	.02	.07	.07
Mid-Atlantic	.02	.02	.01	.004	.01	-	.01	.01
South Atlantic	.01	.008	.005	.003	.004	-	.004	.005
Mid-South	.007	.002	-	-	-	-	-	-
Mountain	.01	.01	.01	-	-	-	-	-
Pacific	.006	-	-	-	-	-	-	-
Total[7/]	.133	.12	.105	.067	.084	.02	.084	.08
Export								
Baltimore	.06	.07	.08	.1	.08	.1	.04	-
Norfolk	.007	.008	.01	.01	.01	.01	.005	.3
New Orleans	.2	.3	.3	.4	.3	.5	.2	.8
Mobile	.01	.01	.02	.02	.01	.02	.008	-
Houston	.3	.4	.4	.6	.4	.7	.2	-
Toledo	.007	.008	.01	.01	.01	.02	.005	-
Chicago	.1	.2	.2	.2	.2	.3	.1	-
West Coast	.4	.4	.5	.7	.6	.9	.3	.6
Total	1.084	1.396	1.52	2.04	1.61	2.55	.858	1.7
Deficit and Exports	1.217	1.516	1.625	2.107	1.694	2.57	0.943	1.785
Storage (Surplus-[Def & Ex])	.112	.084	.491	.432	.636	.091	1.38	.55

Table 7, cont'd

1/A region is defined as a surplus area if production within the region is greater than disappearance and a region is defined as a deficit area whenever the disappearance in an area is greater than production.

2/National Inter-Regional Agricultural Projections (NIRAP) System, Hill and Leath [5,7,8 and 9].

3/Percentage change in U.S. production between 1969 and 1979 extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares published by Hill and Leath [5,7, and 8].

4/Average annual percentage change in U.S. production for the 1969 to 1979 period extrapolated to 1989 U.S. production was allocated among states and regions based on percentage shares as published by Hill and Leath [5,7 and 8].

5/For these scenarios, the baseline production estimates (Table 1) are used but alternative disappearance are identified.

6/For this scenario, the baseline production estimates and disappearance are used but exports are allocated among three super ports.

7/Within each production region, one or more marketing areas (Figures 1 and 3) may be a surplus (deficit) area even though the region is defined as deficit (surplus).

the year 2000, 9.8 billion bushels of surplus grain will be traded annually in the national market (Table 8). About 774 million bushels will move from surplus regions to deficit regions, 6.7 billion bushels will move to export points and 2.3 billion will be stored as carryover (Table 8). In Tables 5, 6 and 7, the surplus and deficit grain producing regions are identified and in Figure 3 the states within each region are identified.

High Grain Production-Disappearance, 1990 (High Grain Estimates)

For the high grain production-disappearance estimates, the percentage changes in U.S. grain production, domestic disappearance and exports from 1969 to 1979 were extrapolated to 1990 [3]. These data were exogenously allocated to the marketing regions based on the percentage shares of production from the NIRAP projections [6]. Total exports were constrained at the 1990 estimated level and carryover was endogenously determined.

U. S. corn production is estimated at 12.9 billion bushels in 1990, an 82 percent increase over the 1978 level. U.S. Soybean production is estimated at 4.5 billion bushels, a 144 percent increase, wheat is estimated at 3.2 billion bushels, a 76 percent increase and total grain production is estimated at 20.6 billion bushels, a 92 percent increase over the 1978 level. (Tables 1, 2, 3 and 4).

Since some grain will be consumed on the farm or in the region where produced, that part of the total grain production will not enter the national grain market. It is estimated that 7.6 billion bushels of surplus corn, 2.6 billion bushels of surplus soybeans and 2.5 billion bushels of surplus wheat will enter the national market in 1990 (Table 5, 6, and 7). For the same year, it is estimated that 12.7 billion bushels of surplus grain will be traded annually (Table 8). About 1.1 billion bushels will move from surplus

and Storage For The U.S. For Three USDA Projections, For Two 1990 Alternative Estimates, And Three 1990 Policy Simulations.

Regions	U.S.D.A. PROJECTIONS[2] 1985	1990	2000	ALTERNATIVE ESTIMATES 1990 High[3]	Baseline[4]	SIMULATION 1990 Export Policy[5]	Storage Policy[5]	Super Ports[6]
	- - - - Billions of Bushels - - - -							
Surplus								
North East	-	-	.006	.02	-	.1	-	-
Mid-Atlantic	.05	.07	.09	.1	.1	.187	.1	.1
South Atlantic	.05	.08	.09	.1	.9	1.064	.9	.9
Delta	.219	.32	.43	.43	.33	.53	.33	.33
Mid-South	.07	.10	.196	.068	.006	.32	.006	.012
Corn Belt	3.23	3.84	4.77	6.8	4.8	5.9	4.8	4.8
Lake States	.67	.59	0.99	1.4	.8	1.3	.8	.8
North Plains	1.65	2.16	2.87	3.0	2.5	2.9	2.5	2.5
South Plains	.22	.26	.32	.43	.32	.44	.32	.32
Mountain	-	-	-	.1	.1	.1	.1	.1
Pacific	-	.01	.03	.3	.3	.3	.3	.3
Total[7]	6.159	7.43	9.772	12.748	10.156	13.141	10.156	10.162
Deficit								
Delta	.1	.2	.2	-	.2	.08	.2	.2
South Plains	.1	.1	.1	.2	.2	-	.2	.2
North East	.15	.12	.08	.07	.14	.12	.14	.14
Mid-Atlantic	.09	.07	.03	.094	.08	-	.08	.08
South Atlantic	.09	.068	.045	.203	.104	-	.104	.105
Mid-South	.012	.042	.009	.1	.06	-	.06	.06
Mountain	.11	.11	.11	.2	.2	.05	.2	.2
Pacific	.206	.2	.2	.2	.3	.09	.3	.3
Total [7/8]	.858	.91	.774	1.067	1.284	.24	1.284	1.285
Export								
Baltimore	.52	.65	.874	1.54	0.98	1.8	.52	-
Norfolk	.447	.458	.755	1.2	.7	1.21	.355	2.7
New Orleans	1.6	1.8	2.733	4.1	2.2	3.9	1.2	2.0
Mobile	.12	.12	.182	.34	.34	.36	.218	-
Houston	.4	.5	.669	1.0	.6	1.1	.3	-
Toledo	.287	.298	.400	.71	.51	.92	.185	-
Chicago	.32	.42	.554	.75	.55	.88	.23	-
West Coast	.4	.4	.500	.7	.9	1.4	.5	2.1
Total	4.094	4.646	6.667	10.34	6.78	11.57	3.508	6.8
Deficit and Exports	4.952	5.556	7.441	11.407	8.064	11.81	4.793	8.085
Storage (Surplus-[Def & Ex])	1.207	1.874	2.331	1.341	2.092	1.331	5.36	2.077

Table 8, cont'd

1/A region is defined as a surplus area if production within the region is greater than disappearance and a region is defined as a deficit area whenever the disappearance in an area is greater than production.

2/National Inter-Regional Agricultural Projections (NIRAP) System, Hill and Leath [5,7,8 and 9].

3/Percentage change in U.S. production between 1969 and 1979 extrapolated to 1989. U.S. production was allocated among states and regions based on percentage shares published by Hill and Leath [5,7, and 8].

4/Average annual percentage change in U.S. production for the 1969 to 1979 period extrapolated to 1989 U.S. production was allocated among states and regions based on percentage shares as published by Hill and Leath [5,7 and 8].

5/For these scenarios, the baseline production estimates (Table 1) are used but alternative disappearance are identified.

6/For this scenario, the baseline production estimates and disappearance are used but exports are allocated among three super ports.

7/Within each production region, one or more marketing areas (Figures 1 and 3) may be a surplus (deficit) area even though the region is defined as deficit (surplus).

production regions to deficit production regions, 10.3 billion bushels will move to export points and 1.3 billion bushels will be stored. The surplus grain production and grain deficit areas are identified in Tables 5, 6 and 7 and are identical to those regions defined in Figure 3 for the USDA projections.

Moderate Grain Production-Disappearance, 1990 (Baseline Estimates)

These moderate production and disappearance estimates were derived by extrapolating the average annual percentage change in U.S. production and disappearance for the 1969-79 period to 1990 [3]. Procedures similar to those used for the high grain scenario were used to allocate the production-disappearance estimates to the marketing regions for the baseline scenario.

Annual U.S. corn production is estimated at 9.5 billion bushels in 1990, a 34 percent increase over the 1978 production level; soybean production is estimated at 3.8 billion bushels, a 107 percent increase; and wheat production is estimated at 3.1 billion bushels, a 73 percent increase (Tables 1, 2, and 3). It is estimated that 16.4 billion bushels of grain will be produced annually by 1990, a 53 percent increase over the 1978 level (Table 4).

For this alternative, it is estimated that by 1990, 4.9 billion bushels of surplus corn, 2.9 billion bushels of soybeans, and 2.3 billion bushels of wheat will be traded annually in the national market (Tables 5, 6 and 7). In Table 8, it is estimated that 10.2 billion bushels of surplus grain will be traded nationally; 1.3 billion will move from surplus regions to deficit regions, 6.8 billion will move to export points and 2.1 billion will be stored. The surplus and deficit production regions are analogous to those described above (Tables 5, 6 and 7 and Figure 3).

Baseline - Increased Export Scenario, 1990 (Export)

Since the baseline estimates represent moderate production-disappearance estimates relative to either the high grain estimate or the NIRAP projections, the baseline data were used to analyze alternative grain disappearance scenarios for 1990. The export scenario assumed that domestic grain disappearance would decrease by 50 percent relative to the baseline scenario, resulting in an increase in the number of grain surplus producing regions, a decrease in the number of grain deficit regions, and a significant increase in grain exports (Tables 5, 6, 7 and 8).

Based on these assumptions, it is estimated that by 1990, 6.9 billion bushels of surplus corn, 3.6 billion bushels of surplus soybeans, and 2.7 billion bushels of surplus wheat will be traded annually in the national market (Tables 5, 6 and 7). It is estimated in Table 8 that 13.1 billion bushels of grain will be traded nationally, an increase of 42 percent relative to the baseline estimate. In contrast, 240 million bushels of grain will be consumed in the deficit producing regions, a decrease of 81 percent relative to the level estimated for the baseline scenario (Table 8). Total grain exports for 1990 are estimated at 11.6 billion bushels, an increase of 71 percent relative to the level estimated for the baseline scenario. About 1.3 billion bushels of grain are stored. Domestic corn deficits will decrease to 220 million bushels, aggregated soybean deficits remain unchanged,[9/] and wheat deficits decrease to 20 million bushels (Tables 5, 6 and 7). Corn exports increased to 6.5 billion bushels, soybean exports increased to 2.5 billion bushels, and wheat exports increased to 2.6 billion bushels.

[9/] Since some marketing regions as depicted in Figure 1 have deficit production, the number of soybean deficit marketing regions actually declined and the total domestic disappearance expressed in bushels also declined. In Table 6, the aggregation of the marketing regions into the production regions negate these changes.

Baseline - Increased Grain Storage Scenario, 1990 (Storage)

The volume of grain stored relative to the moderate baseline scenario is hypothesized to increase due to deteriorating world economic and/or political conditions or due to explicit national policy. Thus, it is assumed that grain exports would decrease by approximately 50 percent relative to the baseline estimates of 1990 and these grains would be stored in the U.S. Since domestic grain disappearances are not altered, the grain surpluses and deficits for each region and for the United States are equal to surpluses or deficits reported for the baseline model (Tables 5, 6, 7 and 8).

For this storage scenario, corn exports declined from 3.6 billion bushels for the baseline scenario to 1.9 billion bushels, soybean exports declined from 1.6 billion bushels to 800 million bushels, and wheat exports declined from 1.6 billion bushels for the baseline scenario to 858 million bushels (Tables 5, 6 and 7). Total exports declined from 6.8 billion bushels for the baseline scenario to 3.5 billion bushels for the storage scenario. Bushels of corn stored increases from 100 million bushels for the baseline scenario to 1.8 billion bushels. Soybean carryover increases from 1.4 billion bushels to 2.2 billion bushels and bushels of wheat stored increased from 636 million to 1.4 billion (Tables 5, 6 and 7). Total bushels of stored grain increases from 2.1 billion bushels for the baseline scenario to 5.4 billion for the storage scenario (Table 8).

Baseline - Super Ports in 1990 - (Super Ports)

Because of technological changes in the transportation system, large super ports may be in use in 1990. At these ports ships can be loaded with 100,000 tons or more of grain for transfer from the United States to Europe, the Soviet Bloc and/or to Asia. For the super port scenario, the baseline grain production, domestic grain disappearance, and total export estimates

are used (Tables 5, 6, 7 and 8).[9/] However, all previous Great Lakes and East Coast grain exports, (Chicago, Toledo, Philadelphia, Norfolk and Charleston) for the baseline scenario exit the country at one super port located at Norfolk; all previous baseline scenario Gulf Coast exports (Mobile, New Orleans and Houston) would exit the country at one super port located at New Orleans and all baseline scenario West Coast exports (Portland) would exit the U.S. at one super port located at Portland. The volume of grain in the surplus regions, the number of surplus regions, grain disappearance in the deficit regions, the number of deficit regions, total exports and the grain stored is equal to that described for the baseline estimates (Tables 5, 6, 7 and 8). Because all exports exit the country at only three locations, the model may endogenously determine new grain flow patterns, alternative transportation options and storage patterns or locations.

RESULTS

Marketing Costs For Eight Scenarios

For the three USDA-NIRAP projections, marketing costs in constant 1974 dollars, ranged from 1.8 billion in 1985 to 2.0 billion in 1990, and to 2.4 billion in 2000 (Table 9). Since all three projections had the same set of activities in their respective basic solution, marketing costs increased in conjunction with increases in volume of surplus grain. Since corn surpluses exceeded the combined sum of the soybean and wheat surpluses (Table 5, 6 and 7), slightly more than half of the total marketing costs were for marketing surplus corn (Tables 10, 11 and 12).

Marketing costs equaled 3.5 billion dollars and 2.8 billion for the high grain and baseline estimates, respectively. A relatively high cost is gen-

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[9/] Because of rounding technique, some slight discrepancies appear when the baseline and super port data are compared.

Table 9. U.S. Grain Shipment From Selected Regions to Deficit Regions and to Export Points, and Marketing Costs in Dollars for Three USDA Projections for 1985, 1990 and 2000, Two Alternative 1990 Production Estimates, and Three Policy Simulations.

	U.S.D.A. PROJECTIONS			ALTERNATIVE ESTIMATES 1990		POLICY SIMULATION 1990		
Cost/Activity	1985	1990	2000	High Grain	Baseline	Export Policy	Storage Policy	Super Ports
Cost in 000,000 $	1827.3	1959.5	2389.5	3506.1	2814.2	3343.3	1936.7	3062.1
	- - - - - - BILLIONS OF BUSHELS - - - - - -							
Total Shipments From Four Selected Regions to all Domestic Regions								
Corn Belt	1.03	0.86	0.97	1.81	1.42	1.98	1.19	2.17
Lake States	0.12	0.11	0.09	0.08	0.05	0.03	0.07	0.24
North Plains	1.10	1.20	0.94	1.92	1.01	1.05	0.62	0.74
Mid-South	0.14	0.15	0.03	0.22	0.21	0.27	0.16	0.21
Total Shipments From Four Selected Regions to all Export Points								
Corn Belt	2.23	2.37	3.30	6.40	4.04	6.24	2.37	3.88
Lake States	0.94	0.99	1.18	1.94	1.22	2.04	0.64	0.91
North Plains	0.28	0.44	0.96	1.05	0.60	1.06	0.06	0.87
Mid-South	0.04	0.44	.48	0.92	0.56	0.87	0.28	0.88
Total Shipments by Mode of Transportation to all Domestic Regions								
Truck	0.29	0.34	0.30	0.55	0.29	0.59	0.28	0.32
Barge	0.20	0.15	0.10	1.02	0.10	0.171	0.12	0.051
Rail	2.12	2.08	2.09	3.96	2.60	3.08	1.86	3.29
Total	2.61	2.57	2.49	4.63	2.99	3.841	2.26	3.661
Total Shipments by Mode of Transportation to all Export Points								
Truck	0.45	0.51	0.60	0.84	0.67	1.00	0.30	0.90
Barge	2.26	2.56	3.60	4.38	2.72	5.12	2.10	3.00
Rail	1.42	1.56	2.45	5.21	3.46	5.56	1.23	3.93
Total	4.13	4.63	6.65	10.43	6.85	11.68	3.63	7.83
Total Modal Shipments to all Domestic Regions and Export Points	6.74	7.2	9.14	15.06	9.84	15.52	5.89	11.49

Table 10. U.S. Corn Shipments From Selected Regions to Deficit Regions and to Export Points, and Marketing Costs in Dollars for Three USDA Projections for 1985, 1990 and 2000, Two Alternative 1990 Production Estimates, and Three Policy Simulations.

	U.S.D.A. PROJECTIONS			ALTERNATIVE ESTIMATES 1990		POLICY SIMULATION 1990		
Cost/Activity	1985	1990	2000	High Grain	Baseline	Export Policy	Storage Policy	Super Ports
Cost in 000,000 $	969.0	1032.0	1275.2	2088.3	1455.5	1708.1	1123.2	1844.4
	- - - - - - BILLIONS OF BUSHELS - - - - - -							
Total Shipments From Four Selected Regions to all Domestic Regions								
Corn Belt	0.66	0.48	0.59	1.09	0.80	0.84	0.70	1.39
Lake States	0.03	0.03	0.03	0.04	0.04	0.02	0.04	0.20
North Plains	0.45	0.61	0.43	1.19	0.54	0.16	0.56	0.26
Mid-South	0.06	-	0.04	0.12	0.09	0.03	0.03	0.03
Total Shipments From Four Selected Regions to all Export Points								
Corn Belt	1.56	1.52	2.12	4.68	2.74	4.27	1.42	2.36
Lake States	0.28	0.35	0.58	0.91	0.49	0.92	0.35	0.21
North Plains	0.28	0.41	0.90	0.90	0.43	0.98	0.06	0.71
Mid-South	0.01	0.06	0.04	0.04	-	0.30	0.05	0.06
Total Shipments by Mode of Transportation to all Domestic Regions								
Truck	0.02	0.02	0.09	0.12	0.01	0.17	-	0.03
Barge	0.13	0.09	0.04	0.10	0.08	0.16	0.10	0.03
Rail	1.11	1.11	1.12	2.43	1.44	0.95	0.28	1.89
Total	1.26	1.22	1.25	2.65	1.53	1.28	1.38	1.95
Total Shipments by Mode of Transportation to all Export Points								
Truck	0.02	0.04	0.07	0.09	0.03	0.03	-	0.33
Barge	1.00	1.10	1.74	2.08	1.20	2.37	0.95	0.35
Rail	1.11	1.20	1.83	4.39	2.43	4.25	0.92	2.99
Total	2.13	2.34	3.64	6.56	3.66	6.65	1.87	3.67
Total Modal Shipments to all Domestic Regions and Export Points	3.39	3.56	4.89	9.21	5.19	7.93	3.25	5.62

Table 11. U.S Wheat Shipments From Selected Regions to Deficit Regions and to Export Points, and Marketing Costs in Dollars for Three USDA Projections for 1985, 1990 and 2000, Two Alternative 1990 Production Estimates, and Three Policy Simulations.

	U.S.D.A. PROJECTIONS			ALTERNATIVE ESTIMATES 1990		POLICY SIMULATION 1990		
Cost/Activity	1985	1990	2000	High Grain	Baseline	Export Policy	Storage Policy	Super Ports
Cost in 000,000 $	642.5	671.3	752.2	947.2	734.8	1083.2	462.8	727.5
	- - - - - - BILLIONS OF BUSHELS - - - - - -							
Total Shipments From Four Selected Regions to all Domestic Regions								
Corn Belt	0.29	0.30	0.32	0.42	0.30	0.54	0.16	0.25
Lake States	0.08	0.08	0.06	0.04	0.01	0.01	0.03	0.04
North Plains	0.64	0.59	0.50	0.73	0.47	0.90	0.07	0.47
Mid-South	0.14	0.15	0.03	0.22	0.21	0.22	0.16	0.21
Total Shipments From Four Selected Regions to all Export Points								
Corn Belt	0.21	0.30	0.43	0.64	0.42	0.57	0.38	0.47
Lake States	0.54	0.51	0.46	0.62	0.53	0.91	0.10	0.51
North Plains	0.002	0.03	0.06	0.08	0.09	-	-	0.09
Mid-South	0.40	0.44	0.48	0.72	0.56	0.87	0.28	0.55
Total Shipments by Mode of Transportation to all Domestic Regions								
Truck	0.19	0.22	0.08	0.26	0.24	0.27	0.16	0.23
Barge	0.07	0.06	0.06	0.02	0.02	0.01	0.02	0.02
Rail	0.94	0.89	0.84	1.20	0.76	1.48	0.27	0.78
Total	1.20	1.17	0.98	1.48	1.02	1.76	0.45	1.03
Total Shipments by Mode of Transportation to all Export Points								
Truck	0.41	0.45	0.51	0.72	0.61	0.94	0.28	0.55
Barge	0.69	0.77	0.90	1.20	0.92	1.32	0.45	0.78
Rail	0.08	0.09	0.09	0.18	0.14	0.17	0.05	0.34
Total	1.18	1.31	1.50	2.10	1.67	2.43	0.78	1.67
Total Modal Shipments to all Domestic Regions and Export Points	2.38	2.48	2.48	3.58	2.69	4.19	1.23	2.70

Table 12. U.S. Soybean Shipments From Selected Regions to Deficit Regions and to Export Points, and Marketing Costs in Dollars for Three USDA Projections for 1985, 1990 and 2000, Two Alternative 1990 Production Estimates, and Three Policy Simulations.

	U.S.D.A. PROJECTIONS			ALTERNATIVE ESTIMATES 1990		POLICY SIMULATION 1990		
Cost/Activity	1985	1990	2000	High Grain	Baseline	Export Policy	Storage Policy	Super Ports
Cost in 000,000 $	215.9	256.1	470.5	470.5	623.9	552.0	350.8	490.2
				BILLIONS OF BUSHELS				
Total Shipments From Four Selected Regions to all Domestic Regions								
Corn Belt	0.07	0.07	0.06	0.30	0.32	0.61	0.32	0.53
Lake States	-	-	-	-	-	-	-	-
North Plains	0.06	0.10	0.13	0.10	0.01	0.14	0.01	0.06
Mid-South	0.01	0.002	0.007	0.06	0.06	0.004	0.06	0.07
Total Shipments From Four Selected Regions to all Export Points								
Corn Belt	0.47	0.56	0.75	0.90	0.88	1.40	0.57	1.06
Lake States	0.13	0.13	0.14	0.24	0.20	0.22	0.19	0.19
North Plains	0.09	0.13	0.31	0.35	0.17	0.48	0.06	0.30
Mid-South	0.07	0.06	0.15	0.09	0.07	0.21	0.07	0.07
Total Shipments by Mode of Transportation to all Domestic Regions								
Truck	0.08	0.10	0.13	0.17	0.04	0.15	0.12	0.06
Barge	-	-	-	-	-	0.001	-	0.001
Rail	0.07	0.08	0.13	0.33	0.40	0.65	0.31	0.62
Total	0.15	0.18	0.26	0.50	0.44	0.801	0.43	0.681
Total Shipments by Mode of Transportation to all Export Points								
Truck	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.02
Barge	0.57	0.69	0.96	1.10	0.60	1.43	0.70	1.87
Rail	0.23	0.27	0.53	0.64	0.89	1.14	0.26	0.60
Total	0.82	0.98	1.51	1.77	1.52	2.60	0.98	2.49
Total Modal Shipments to all Domestic Regions and Export Points	0.97	1.16	1.77	2.27	1.96	3.40	1.41	3.17

erated because these scenarios transport relatively large volumes of surplus grain to deficit regions and to export points.

Marketing costs ranged from 3.3 billion dollars to 3.1 billion for the export and super port scenarios, respectively. The marketing costs for these two export scenarios exceed the marketing costs generated by the 1990 baseline scenario (Table 9). The added marketing cost for the export scenario is due to the added grain surpluses which are flowing to the export points. For the super port scenario, the added costs reflect different flow patterns and transportation rates and an increase in the bushels of grain transshipped among regions to satisfy final demands. For example, surplus grain which formerly moved to the lake ports at relatively low transportation rates now flows further distances to the Atlantic ports at higher transportation rates. Also, these grains may be shipped short distances by truck to a unit train station to be transshipped to the coast.

For the 1990 period, marketing costs were 1.9 billion dollars for the storage scenario which stores relatively large volumes of grain and ships relatively small quantities from surplus to deficit regions and to export points (Tables 5, 6, 7, 8 and 9). Marketing costs for this scenario were relatively low because the additional storage costs created by storing more grain in the storage scenario was less than the decrease in transportation cost to transport additional grain to meet final demands in the baseline scenario.

Grain Shipments to Deficit Regions for Eight Scenarios

Based on the USDA-NIRAP projections, total shipments by mode of transportation to all destinations including exports increased from 6.7 billion bushels in 1985 to 7.2 billion in 1990, to 9.1 billion in 2000; however, total shipments to domestic grain deficit regions declined from 2.6 billion

bushels in 1985 to 2.5 billion in 2000 (Table 9). The decline in domestic grain shipments is a mirror image of the projected decrease in grain deficits (Table 8). For all three projections, total domestic grain shipments by mode of transportation are greater than the aggregated grain deficits and export demands (Tables 8 and 9). This difference reflects transshipments of grain; that is, for example, the movement of grain from one selected region in Illinois by truck to a second region in Illinois where the grain is loaded onto a barge and is shipped down the river to meet a final demand.

The percentage of grain shipped by mode of transportation for all three NIRAP projections is similar. Approximately 11 percent of all grain shipments to domestic regions moved by truck, seven percent moved by barge, and 81 percent moved by rail while approximately 11 percent of all grain shipments to export points moved by truck, 55 percent moved by barge, and 34 percent moved by rail (Table 9). All truck shipments to the domestic regions and to export points are for relatively short distances. Rail shipments to domestic regions are relatively large compared to truck movement because rail rates are lower than those quoted by truck companies for comparable distances. Because most firms which are located in the grain deficit domestic regions do not have access to barge traffic, the volume of grain moving on barges is relatively small. In contrast, barge movements of grain to export points are relatively important because export firms have access to barge lines and the transportation rates for barge traffic is relatively low compared to rates quoted by rail companies for equivalent distances.

Firms located in the Corn Belt shipped large quantities of grain into the deficit regions. The Lake states, North Plains and the South Plains surplus production regions were also major suppliers of grain (Table 9). Corn shipments to the North East and to the Mid-Atlantic, Mid-South, South Atlantic,

Delta and South Plains (hereafter South) grain deficit regions originated from the Corn Belt (Table 10 and Figure 4). Grain elevators located in the South and in the North Plains surplus grain producing regions shipped grain into the South. The North Plains region also shipped grain to the Pacific and Mountain (these two regions hereafter are referred to as the West) grain deficit regions (Figure 5). Approximately 2 percent of all corn shipments into the domestic regions moved by truck, 10 percent moved by barge, and 88 percent moved by rail (Table 10).

Wheat shipments to the South and North East also originated in the Corn Belt, the Lake states and in the South Plains production areas (Table 11 and Figure 6). Because wheat processors in the Corn Belt require different varieties of wheat for processing flour, wheat originating in the Plains area also flowed into the Corn Belt. Truck movements of wheat vary from 16 percent of the total movements in 1985 to 8 percent for 2000; barge movements averaged 5 to 6 percent for the three NIRAP projections while rail movements vary from 78 percent of the total in 1985 to 85 percent in 2000 (Table 11). Truck movements as a percent of the total grain movements decreased while rail movements increased for the 15-year period because total domestic demand is projected to decrease and much of the decreased movement eliminates "short haul" opportunities. Therefore, truck traffic loses its comparative advantage to rail traffic as a larger percentage of the total wheat shipments travel longer distances to meet final demands.

Soybean shipments into grain deficit areas and the number of shipment patterns are inconsequential relative to corn and wheat shipments (Table 12 and Figure 7). Since most soybeans are processed in the region in which they are produced or flow to export points, only small quantities flow among regions in the Corn Belt and to processors located in the South. Most ship-

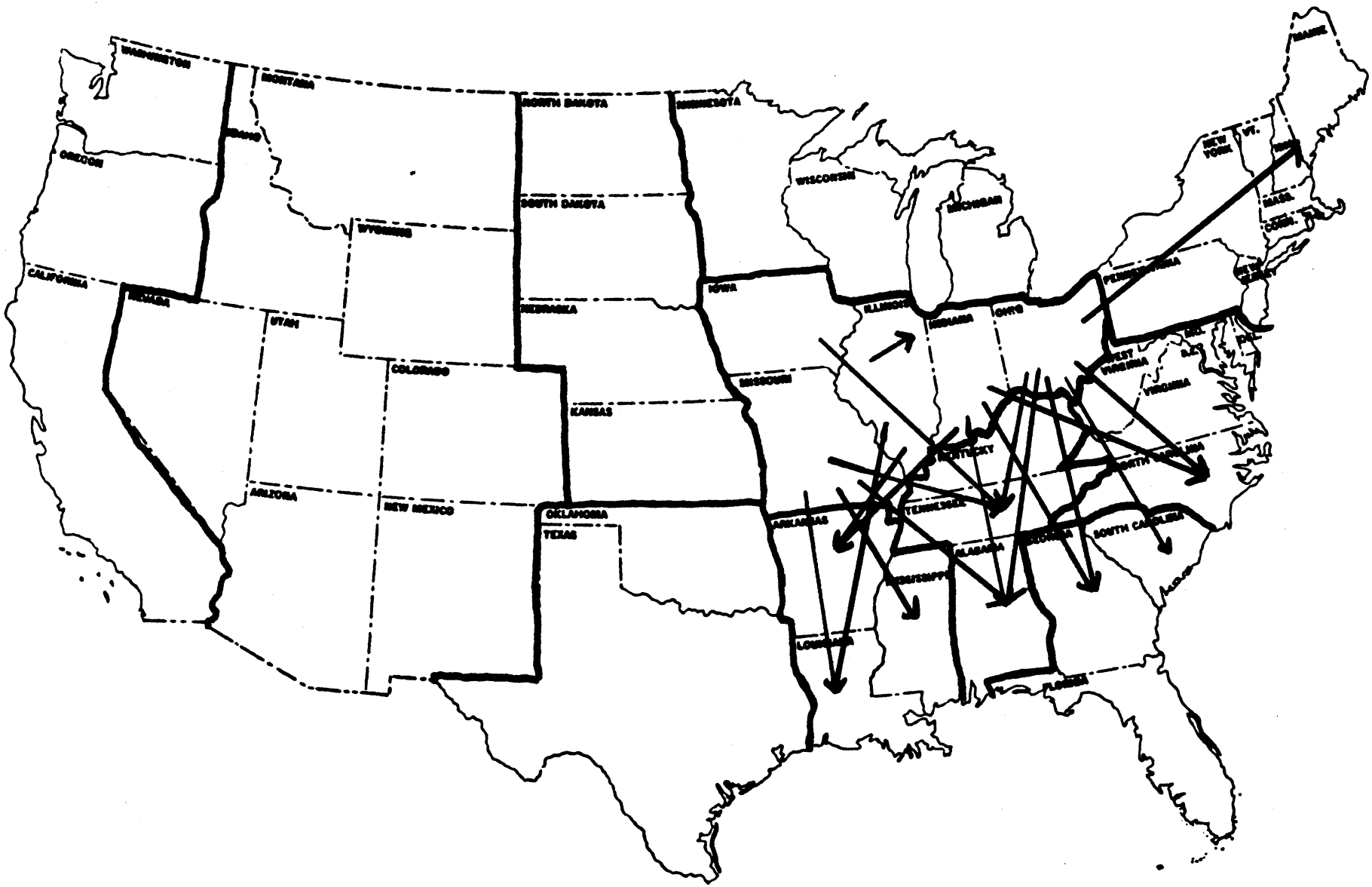

Figure 4. Corn Belt Corn Shipment Patterns to Grain Deficit Areas: USDA 1990 Projections

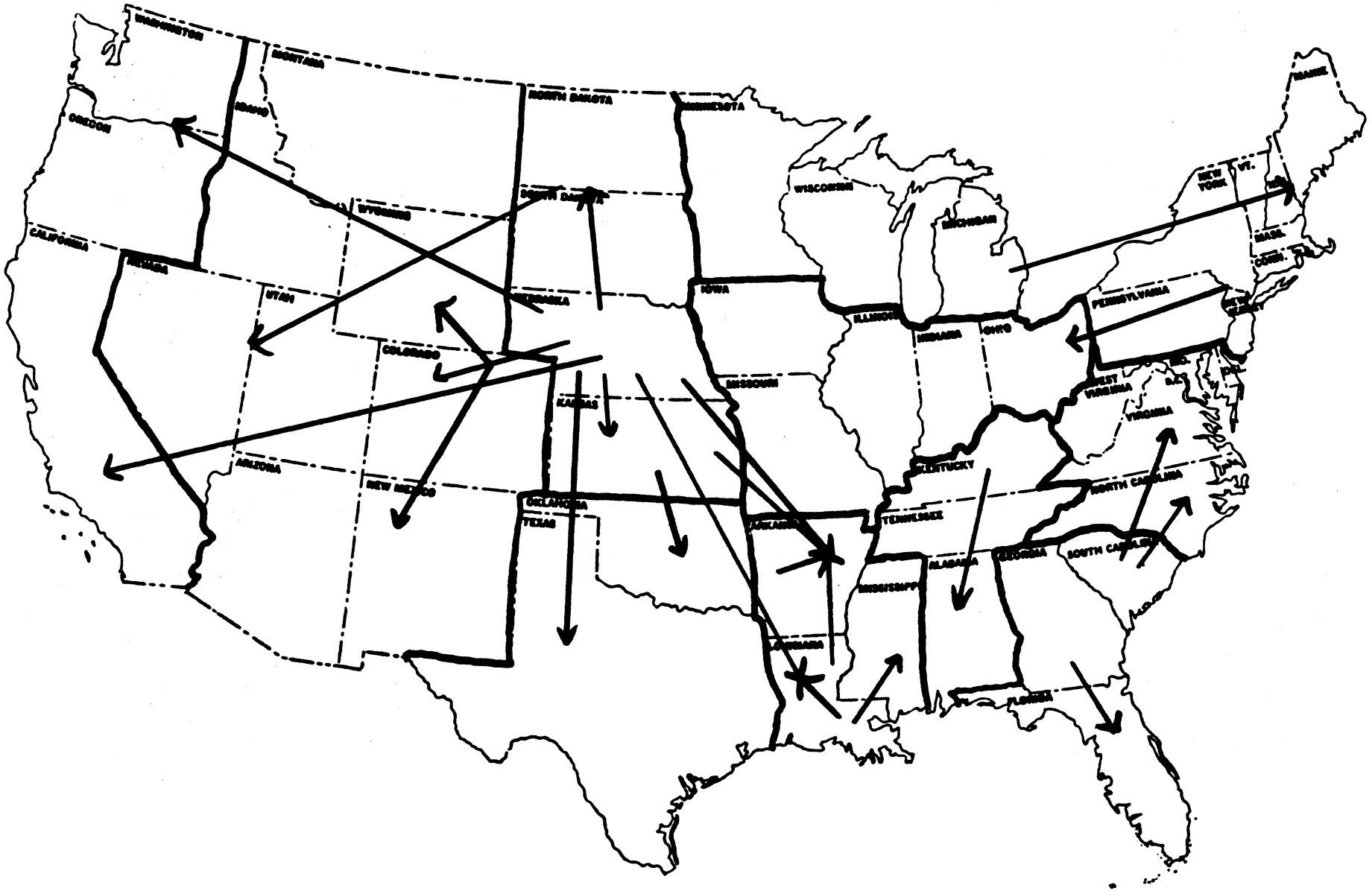

Figure 5. Plains and South East Corn Shipment Patterns to Deficit Grain Producing Regions: USDA 1990 Projections

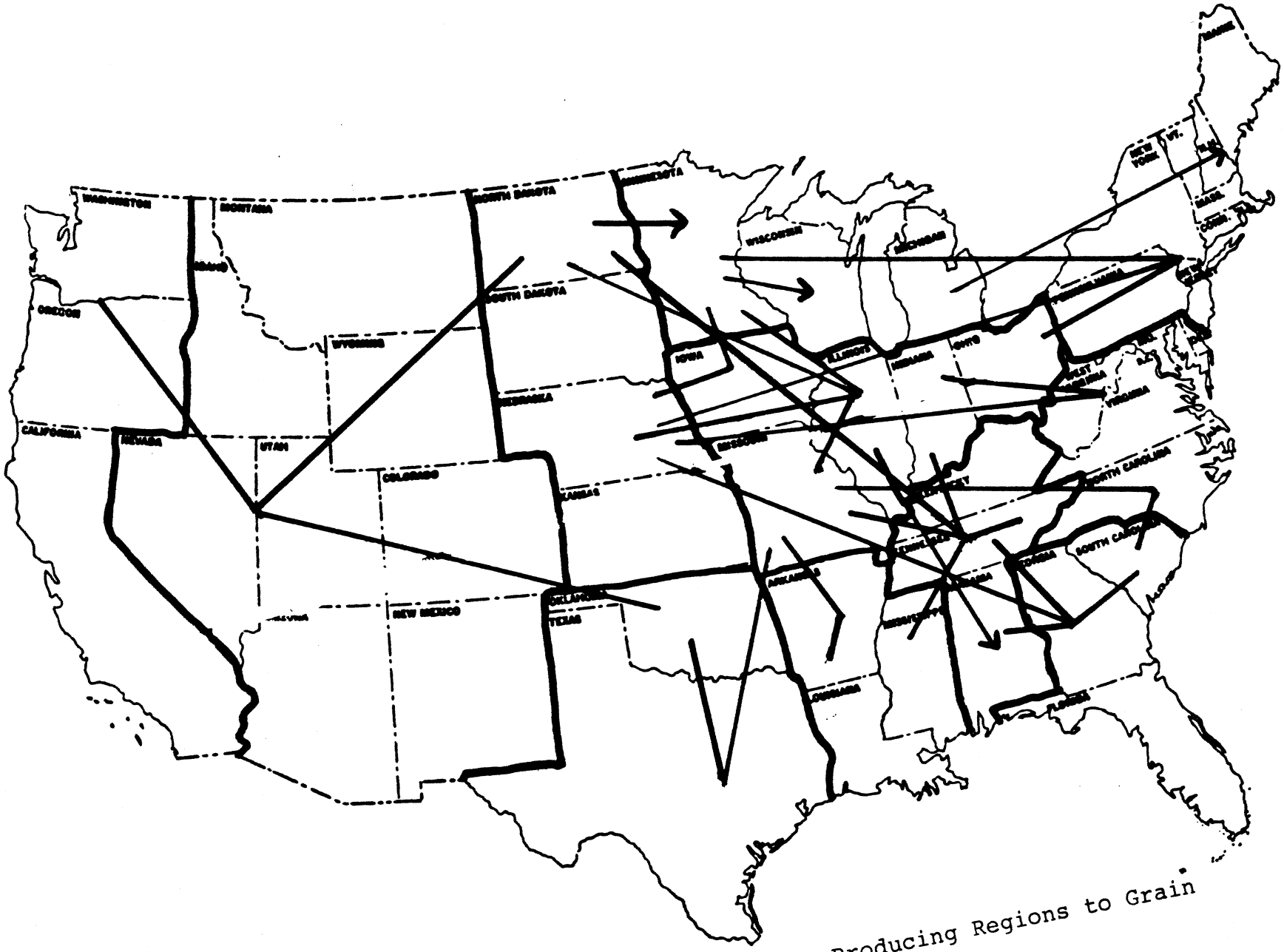

Figure 6. Wheat Shipment Patterns From Surplus Producing Regions to Grain Deficit Areas: USDA 1990 Projections

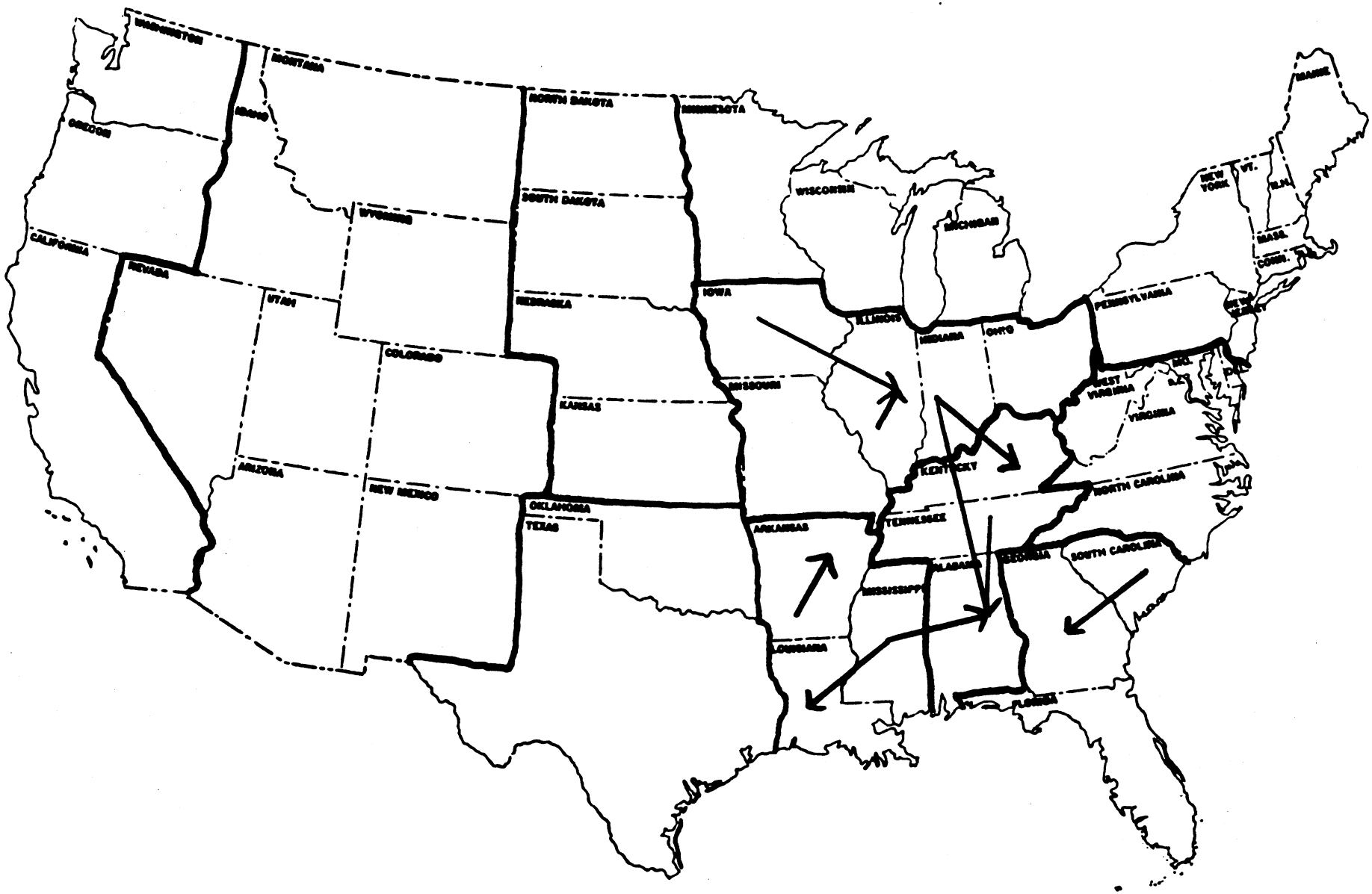

Figure 7. Soybean Shipment Patterns From Surplus Producing Regions to Grain Deficit Areas: USDA 1990 Projections

ments are evently distributed between truck and rail movements because approximately one-half of all soybean movements travel short distances by truck and one-half moves relatively long distances on rail cars.

Domestic grain shipment patterns by mode of transportation for the storage, high grain and export scenarios are similar to those discussed for the USDA-NIRAP projections; only the magnitude of the grain flows change. For example, total grain shipments ranged from 5.9 billion bushels for the storage scenario to 15.5 billion bushels for the export scenario (Table 9). For the high grain scenario, corn also flows from the Corn Belt into the North and South Plains regions.

For the super port scenario, corn originating in the Corn Belt flows into the South, North East, Plains regions and the West (Figure 8). Changes in the flow patterns relative to the baseline scenario occur because firms located in some Corn Belt production regions lose their economic advantage to ship grain to export points (Figures 4 and 8). Only those firms which have access to relatively lower unit train rates ship corn to the super ports while the other firms ship grain into the domestic market for the least cost solution.

Most of the above grain movements were transported from the grain surplus regions to the deficit regions by rail (Table 9). This finding is similar to that reported for the USDA-NIRAP projections. However, additional corn and soybean transshipments occur (Table 9, 10 and 12).

Grain Shipments To Export Points For Eight Scenarios

Based on the USDA projections, it is estimated that the U.S. will export 4.1 billion bushels of grain in 1985 and 6.7 billion in 2000.[10/]

[10/] These grain exports were not a part of the USDA projections. They were estimated by subtracting domestic grain deficits from grain surpluses.

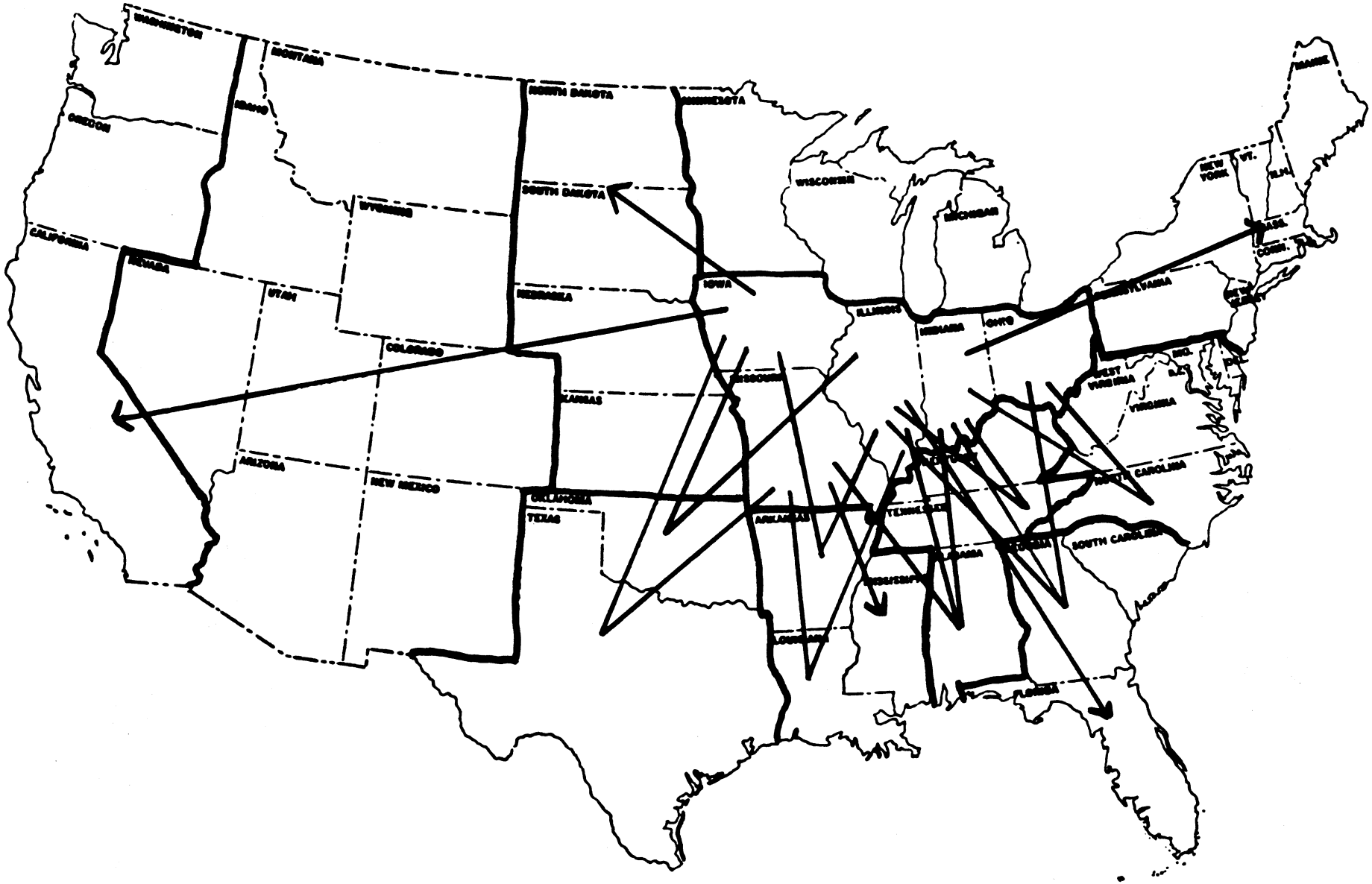

Figure 8. Corn Belt Corn Shipment Patterns to Grain Deficit Areas: Super Port 1990 Scenario

(Tables 8 and 9). Since the 1980 grain export volume is estimated at 5 billion bushels, the USDA production-disappearance projections estimate a decrease in grain exports during the next decade.

If the high production or baseline scenarios emerge during the next decade, total grain exports in 1990 could equal 10.4 billion bushels or 6.8 billion, respectively (Table 8 and 9). In the export scenario, the U.S. could ship 11.7 billion bushels of grain into the world market in 1990.

For all eight scenarios, grain exports originated in the Corn Belt, the Lake states, North Plains and South Plains grain production regions (Tables 9, 10, 11 and 12). Corn originated primarily in the Corn Belt, the Lake states and in the North Plains area (Figure 9). Illinois, Indiana and Ohio supplied corn to the Lake ports and to the Atlantic and Gulf ports. The Gulf also received corn from other corn belt states, the Lake states and from the Plains regions. All West Coast corn exports originated in the Plains and Lake states areas.

Wheat exports for the eight scenarios also originated in the Corn Belt, Lake states, North Plains and South Plains grain production regions (Figure 10). Since only small quantities of wheat exit the country through the Lake ports, all wheat movements to the Lake ports originated in Nebraska, Illinois, Indiana, Michigan and in Ohio. The Atlantic Coast exports originated only in Ohio, an unrealistic finding. This single flow pattern emerged because changes in daily wheat prices are not incorporated into the model and the demands for different classes of wheat are not identified. If prices and wheat classes were also included in the model, wheat shipments to the Atlantic ports would originate throughout the Corn Belt, Lake states and the Plains grain surplus regions. The wheat shipments to the Gulf originated in the South, Corn Belt and in the Lake states while shipments to the West Coast

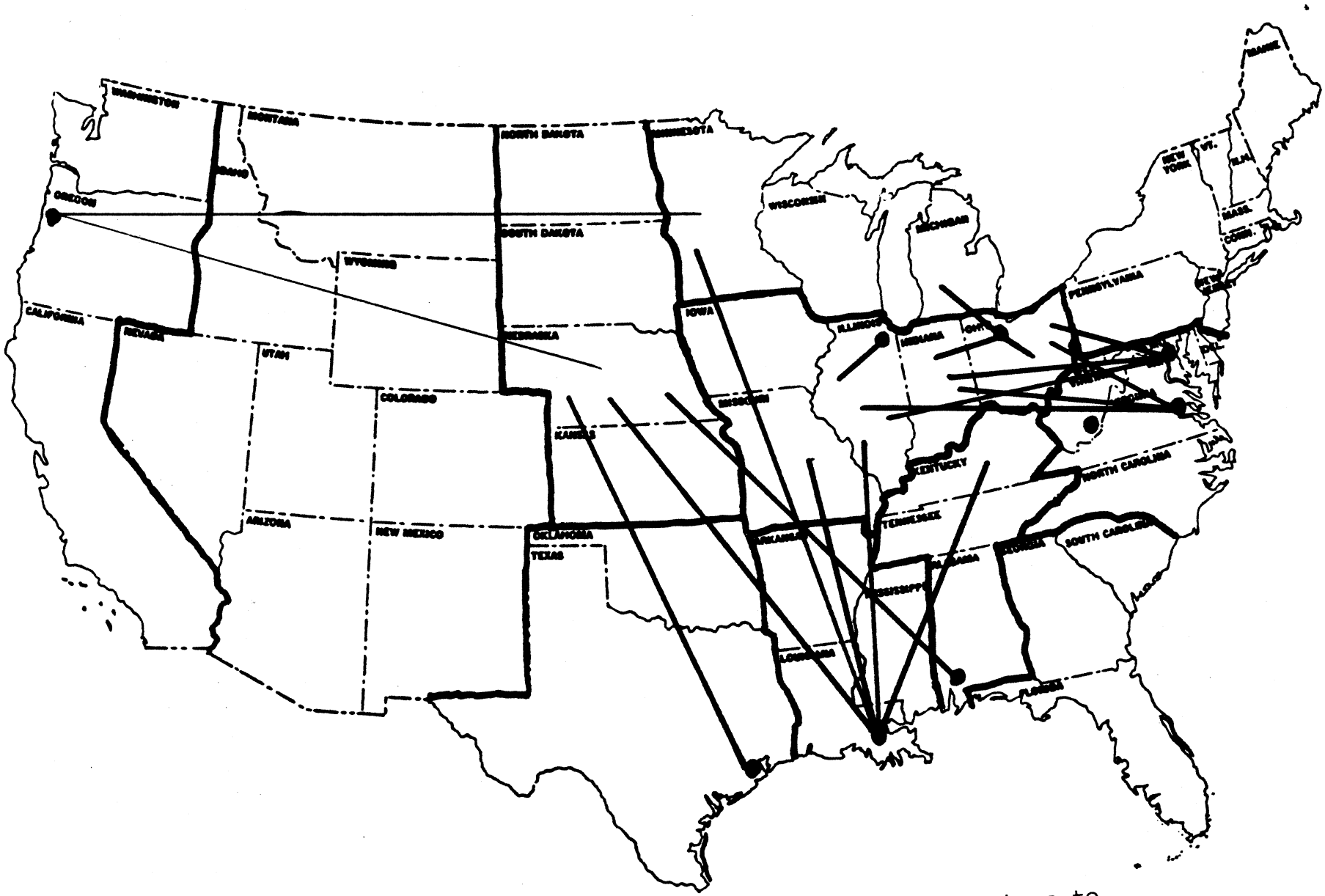

Figure 9. Corn Shipment Patterns for Grain Surplus Regions to Export Ports: 1990 Base Line Estimate

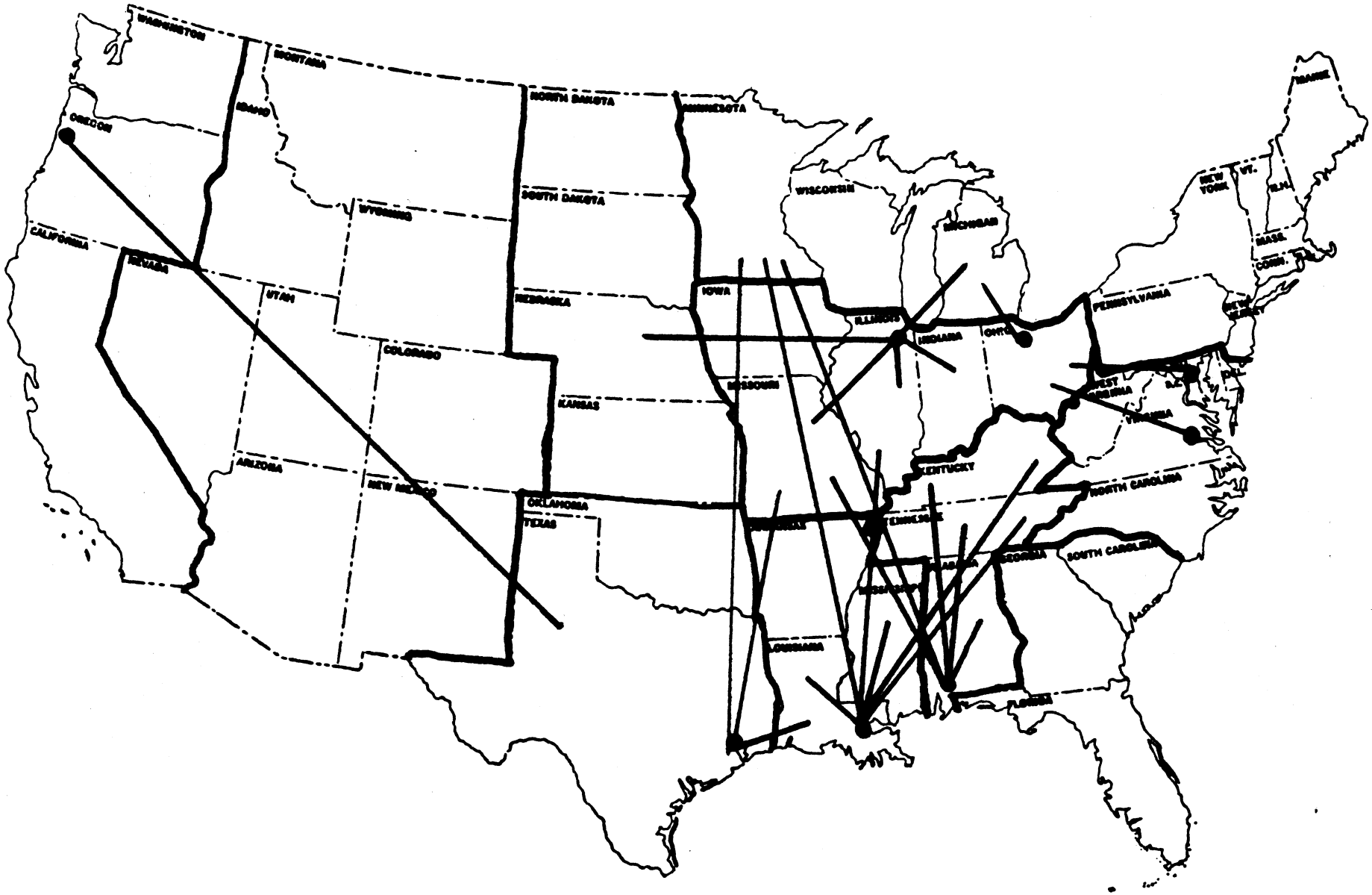

Figure 10. Wheat Shipment Patterns for Grain Surplus Regions to Export Ports: 1990 Base Line Estimate.

originated only in Texas, again an unrealistic finding. As illustrated in Figures 6 and 10, the North Plains surplus regions ship all surplus wheat to grain deficit regions rather than to export. Again, if prices and export demands for different classes of wheats were also incorporated into the model, this result would change.

Soybean exports originated in the Corn Belt, Lake states and in the Mid-South and Delta regions. The latter two regions were not important exporters of corn and wheat. Thus, regional differences in production and marketing of grain emerge (Figure 11). The Corn Belt and Lake state ship soybeans to the Lake ports while soybean exports to the Atlantic originated in the Corn Belt and in the South. Exports to the Gulf originated in the Corn Belt, South, and Plains production areas, while exports to the West Coast originated in Minnesota and Iowa.

The above grain flow pattern changes when the super port scenario is introduced. The Atlantic super port acquires corn from the Corn Belt and Lake states regions; the Gulf's exports originate in the Corn Belt and South while shipments to the West Coast originate in the Lake states and Plains production areas (Figure 12). For wheat, the Atlantic super port acquires shipments from the Lake states, the Corn Belt and the South; the Gulf's exports originate in the South, Corn Belt, Lake states and Plains production areas. The West Coast exports again have Texas origin (Figure 13).

Similar flow patterns also emerge for soybeans (Figure 14). The Atlantic super port acquired soybeans from the Corn Belt, the South and from the Lake states production areas. All Gulf super port soybeans originated in the South, the Lake states, the Corn Belt and in the Plains regions. Far West exports originated from the Lake states and the Corn Belt production areas.

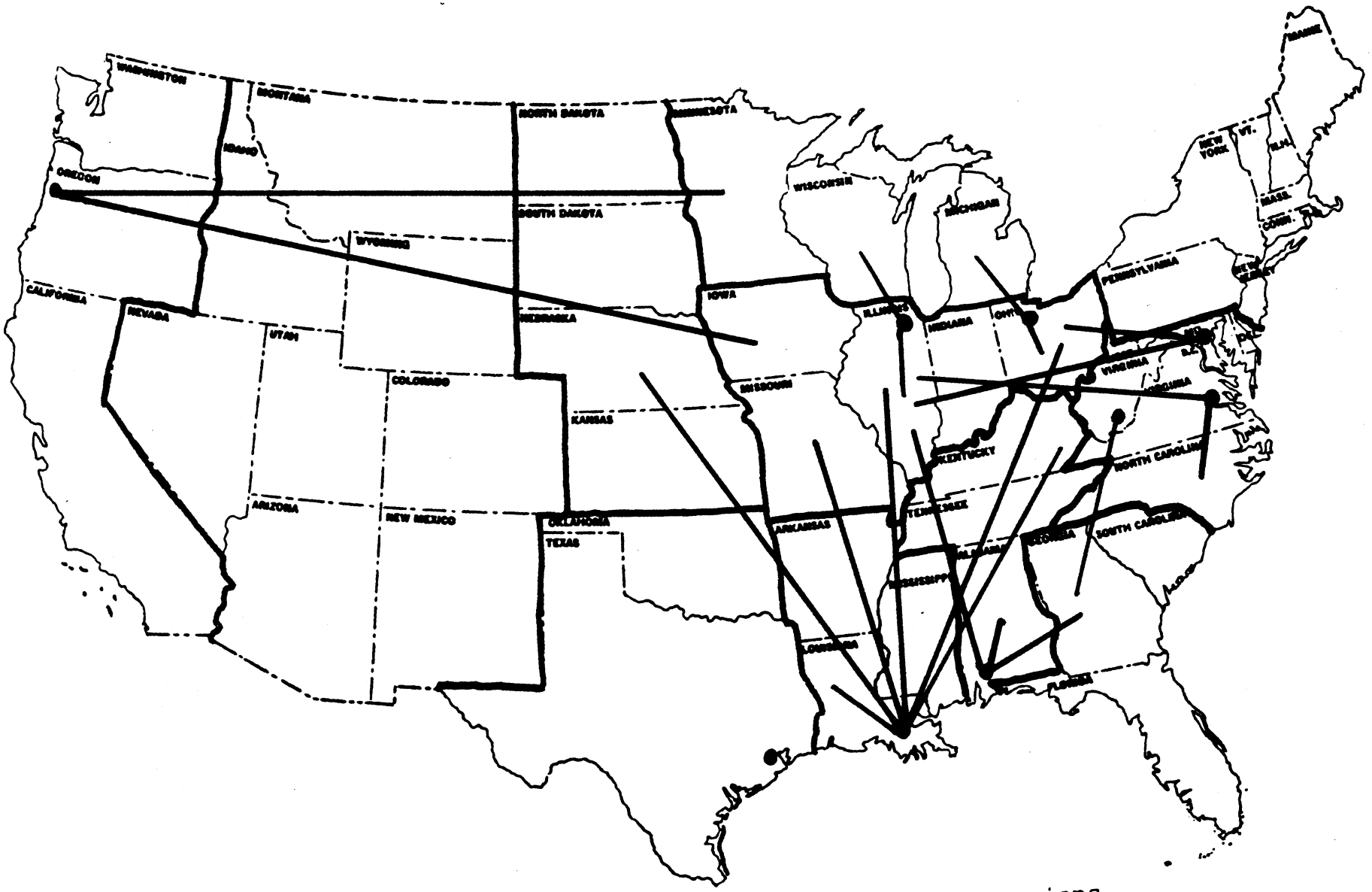

Figure 11. Soybean Shipment Patterns from Grain Surplus Regions to Export Points: 1990 Base Line Estimate.

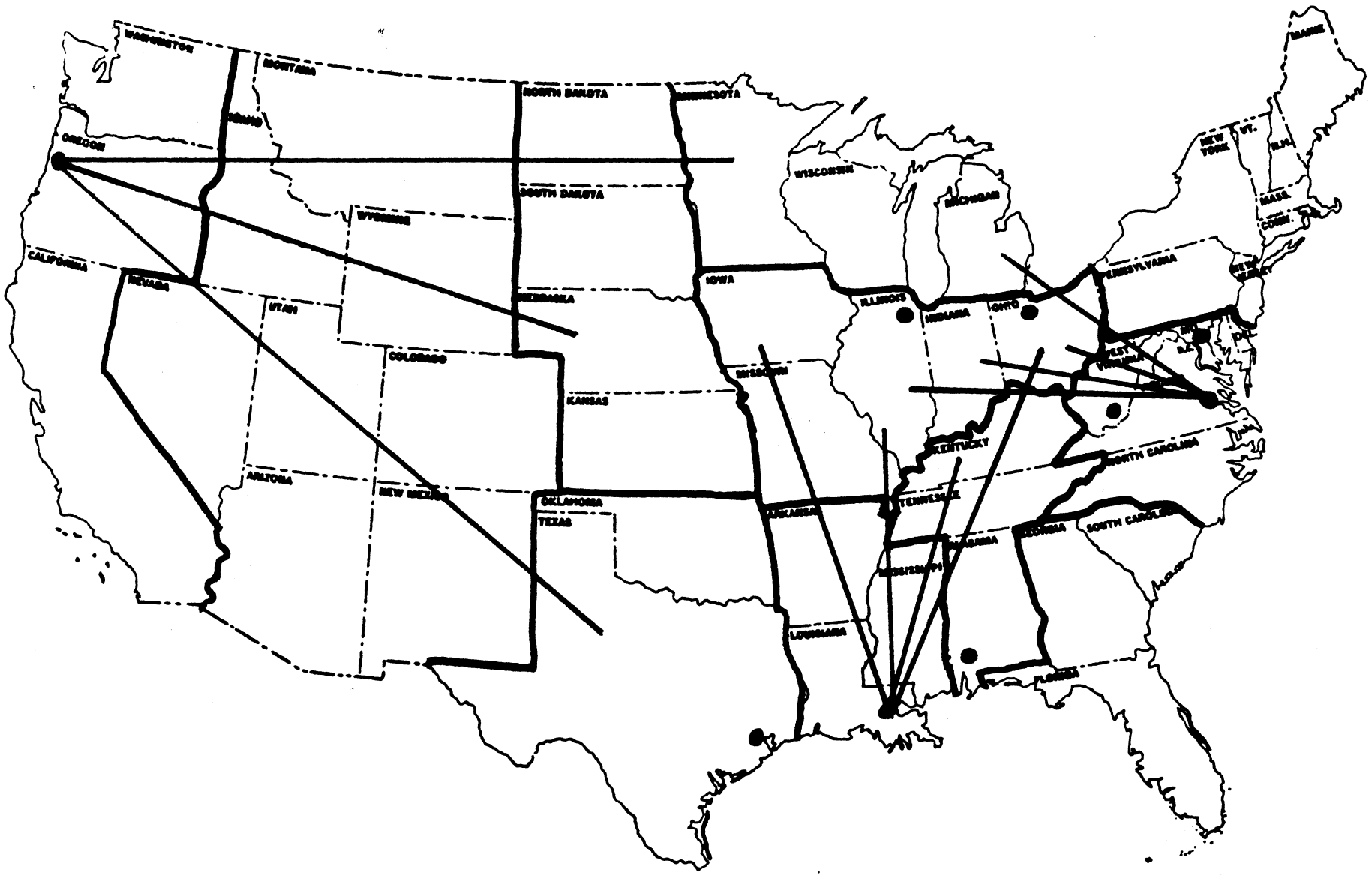

Figure 12. Corn Shipment Patterns from Grain Surplus Regions to Export Points: 1990 Super Port Scenario

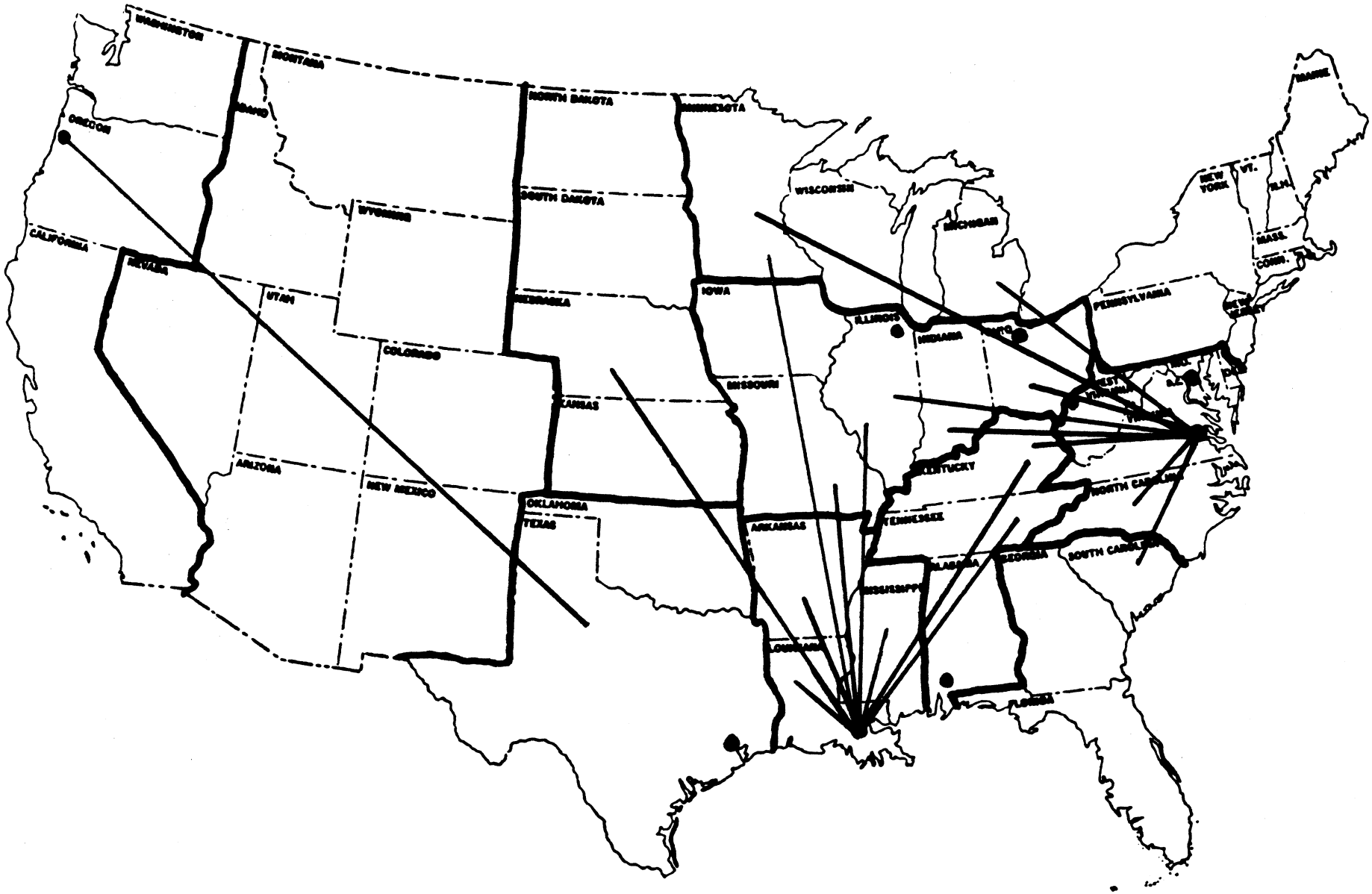

Figure 13. Wheat Shipment Patterns from Grain Surplus Regions to Export Points: 1990 Super Port Scenario

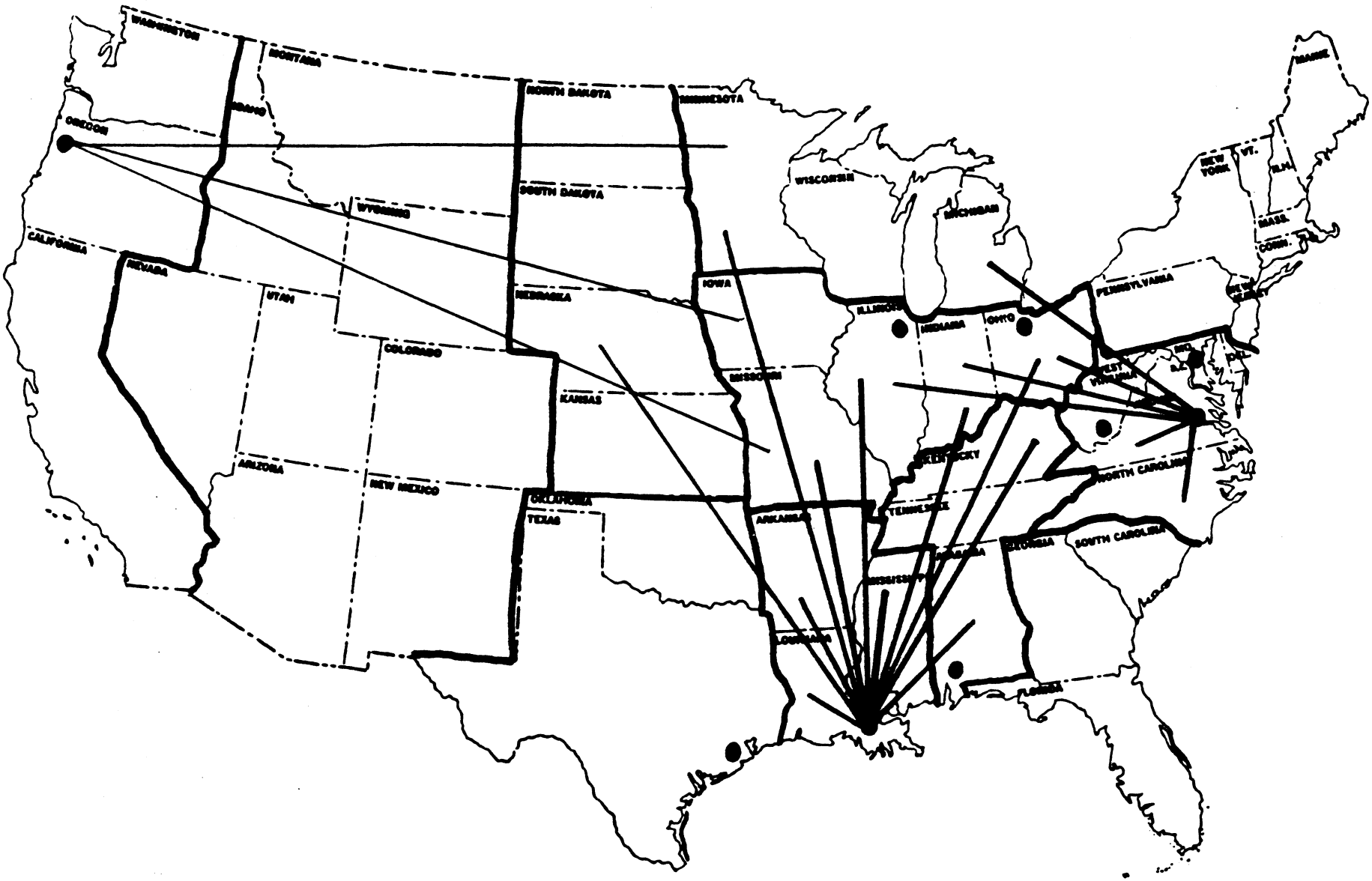

Figure 14. Soybean Shipment Patterns from Grain Surplus Regions to Export Points: 1990 Super Port Scenario.

Trucks, railroad cars and barges are used to ship grain to the above export points (Table 9). When the total volume of grain moving to exports is relatively low, barge is the most important transportation option, hauling approximately 55 to 57 percent of all total grain shipments (Table 9). Movements of grain to export points via rail increase in importance with the increase in the volume of grain flowing into the export channels. Rail becomes more important because more total bushels of grain are moving to export points from origins which do not have access to barge traffic.

Most barge traffic moves down the Ohio, Illinois and Mississippi rivers to the Gulf ports. Trains are used to move grain to the East and West coast; however, some rail movements also flow to the Gulf. Most truck traffic flows to the Lake ports with minimal traffic flowing to other major export areas.

The above modal shares are applicable for movements for each grain. Approximately 50 percent of all corn exports are handled by rail and barge services, respectively (Table 9). For soybeans, approximately 70 percent of the shipments to export points move by barge and 28 percent of the total shipments move by rail. Rail becomes a more dominate mode of transportation as the volume of corn and soybean exports increases. Since a large volume of wheat is exported via the Gulf, the barge system handles most of the wheat exports (Table 9). Truck shipments of wheat also move to the Lake ports.

Grain Storage For Eight Scenarios

Grain shipments into the deficit areas and export points occur throughout the year. Thus, firms must store grain after the harvest in order to meet future demands. To simulate this important activity, the model stores grain through two time periods, July to December and January to June.[11/]

[11/] Storage in this model is for grain which is being traded in the national market.

Carryout at the end of each year for the USDA projections ranges from 1.2 billion bushels in 1985 to 2.3 billion by 2000.[12/] (Table 8). This estimated carryout approximates the 1980 estimated carryout of 1.7 billion bushels [3]. For the 1990 alternative scenarios, carryout varies from 1.3 billion bushels for the export scenario to 5.4 billion for the storage scenario (Table 8). For the 1990 USDA-NIRAP projection and the 1990 baseline estimate, corn carryout is stored in the Corn Belt, soybeans are stored predominantly in the Corn Belt with minor concentrations in six or seven different regions and wheat is stored in the North Plains states (Table 13). When the storage scenario is introduced, corn is stored in three regions, soybeans are stored in eight regions, and wheat is stored in five different regions.

The carryover for the July-December period is stored by grain elevators which are located in the grain surplus producing regions, the Corn Belt, Lake states, North Plains and South Atlantic regions (Table 13). Most of the corn caryout for the January-June period is stored in the Corn Belt, Lake states and North Plains areas. Soybeans are stored in a wider geographical area; however, the heaviest concentration is in the Corn Belt and Delta regions. Wheat, too, is stored in a number of regions with the heaviest concentration in the Corn Belt, North Plains and Lake states regions.

The bushels of grain stored in the July to December period are shown in Table 13. Since similar trends exist for the eight scenarios, data are presented for only three options, the USDA 1990 projections, 1990 baseline projections and the 1990 storage policy option. For these three scenarios, total carryover for the July to December period ranges from 4.9 billion bushels for

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[12/] Carryout data are not USDA projections. These data were derived by subtracting U.S. grain deficits from grain surpluses.

Table 13. Bushels of Grain Stored By Elevators For Eleven Production Regions For The 1990 U.S.D.A. Projection, The 1990 Moderate Production Estimate, and For The Storage Policy 1990 Simulation For Two Time Periods 1/

Policy	July - December				January - June			
	Corn	Soybeans	Wheat	Total	Corn	Soybeans	Wheat	Total
	(000,000 Bushels)							
USDA 1990 Projection								
North East	-	-	-	-	-	-	-	-
Mid-Atlantic	-	0.05	-	0.05	-	0.02	-	0.02
South Atlantic	0.01	0.04	0.001	0.051	-	0.04	-	0.04
Delta	-	0.25	0.02	0.27	-	0.13	-	0.13
Mid-South	0.06	0.06	0.02	0.14	-	0.001	-	0.001
Corn Belt	1.86	0.77	0.41	3.04	1.0	0.48	-	1.48
Lake States	0.35	0.02	0.12	0.49	-	-	-	-
North Plains	0.41	0.06	0.25	0.72	-	0.06	0.17	0.23
South Plains	-	0.02	0.10	0.12	-	0.02	-	0.02
Mountain	-	-	-	-	-	-	-	-
Pacific	-	-	-	-	-	-	-	-
TOTAL	2.69	1.27	0.921	4.881	1.0	0.751	0.17	1.92
1990 Baseline Production								
North East	-	-	-	-	-	-	-	-
Mid-Atlantic	-	0.07	-	0.07	-	0.08	-	0.08
South Atlantic	0.002	0.06	0.002	0.064	-	0.07	-	0.07
Delta	-	0.15	0.03	0.18	-	0.18	-	0.18
Mid-South	0.07	0.04	0.03	0.14	-	0.05	-	0.05
Corn Belt	1.49	0.67	0.53	2.69	0.2	0.84		1.04
Lake States	0.23	0.03	0.15	0.41	-	0.04		0.04
North Plains	0.52	0.02	0.30	0.84	-	0.02	0.6	0.62
South Plains	-	0.02	0.13	0.15	-	0.02	-	0.02
Mountain	0.006	-	-	0.006	-	-	-	-
Pacific	-	-	-	-	-	-	-	-
TOTAL	2.318	1.06	1.172	4.55	0.2	1.3	0.6	2.1

Table 13. Bushels of Grain Stored By Elevators For Eleven Production Regions For The 1990 U.S.D.A. Projection, The 1990 Moderate Production Estimate, and For The Storage Policy 1990 Simulation For Two Time Periods[1/]

Policy	July - December				January - June			
	Corn	Soybeans	Wheat	Total	Corn	Soybeans	Wheat	Total
	(000,000 Bushels)							
1990 Storage Scenario								
North East	-	-	-	-	-	-	-	-
Mid-Atlantic	-	.12	-	.12	-	.11	-	.11
South Atlantic	0.002	.08	0.002	.084	-	.08	-	.08
Delta	0.001	.43	0.03	.461	-	.49	0.03	.52
Mid-South	0.06	.14	0.03	.23	-	.002	0.003	.005
Corn Belt	2.41	1.51	0.47	4.39	.95	1.23	0.2	2.38
Lake States	0.18	.04	0.07	.29	.06	.02	0.07	0.15
North Plains	0.73	.14	0.78	1.65	.79	.20	1.1	2.09
South Plains	-	.04	0.19	.23	-	.038	-	.038
Mountain	0.006	-	-	0.006	-	-	-	-
Pacific	-	-	0.01	0.01	-	-	-	-
TOTAL	3.389	2.5	1.582	7.471	1.8	2.17	1.403	5.373

[1/] The First Time Period is July-December and the Second is January-June.

the USDA-NIRAP projections to 7.5 billion for the storage scenario. In contrast, the January 1, 1980, grain carryover was estimated to be 10.4 billion bushels [10]. Although the 1980 storage estimate exceeds the 1990 USDA-NIRAP projected carryover by 5.5 billion bushels, the 1990 baseline estimate by 5.8 billion bushels and the 1990 storage scenario by 3.6 billion bushels, the difference represents accounting procedures and not error. Therefore, the 1980 storate estimates includes all grain in storate for inter- and intra- state or regional commerce. For the 1990 projections and estimates, the quantities stored includes only grain that is moving in interstate traffic. Therefore, the 1990 projected and estimated quantities of grain in storage would be less than what is estimated to be stored in January 1980.

CONCLUSIONS AND IMPLICATIONS

During the next two decades, grain movements from surplus grain producing regions to grain deficit regions will follow traditional grain flow patterns. Grain produced in the eastern Corn Belt (Ohio, Indiana and parts of Illinois) will flow to deficit regions in the Northeast, the Mid-Atlantic, Mid-South, South Atlantic and to export points located on the Great Lakes, Atlantic Coast and at Gulf ports. Grains produced in the western Corn Belt (Missouri, Iowa and parts of Illinois) will flow to the above regions and export points and to the Delta and Plains regions. Grains originating in the Plains area will flow into the Corn Belt, Mountain, Pacific and South producing regions and to Gulf and West Coast export points. Grains produced in the South will move to southern grain deficit regions and to Eastern and Gulf ports. Because the Corn Belt has a soybean and corn production comparative advantage and the Plains regions have a wheat production comparative advantage, there is no evidence that the directional grain flow patterns will change during the remainder of this century.

Rail will continue as a dominant transportation mode for transferring grain from surplus producing regions to dificit regions. Barge traffic, on the other hand, will continue to be the dominant mode for transporting grain to export points. Trucks will be used for relatively short hauls and for multi-mode grain movements, such as a movement of grain from central Ohio by truck to a train or barge loading station where the grain is then shipped to its final destination. These observations should be tempered by the fact that the supply of transportation services was not constrained in the model. Thus, variations in the volume of grain hauled by each mode of transportation may vary in response to the availability of the transportation services. In addition, the introduction of alternative rail and barge rates, increased rail abandonment, the introduction of a new barge route and/or unit train facilities could alter these finding.

All surplus grain will be stored within the region in which it is produced. Any future increase in transportation costs or the introduction of seasonal transportation rates (higher rates charged during the harvest season) will also reenforce this finding. Since the model did not have storage restrictions and was transferring only interregional or interstate grain movements through time, all surplus grain was stored at elevators. If storage restrictions were built into the model, some grain would be stored on farms. Although this change would introduce more realism into the findings, it would not alter grain surpluses or deficits by production region, grain movements from the surplus regions to the deficit areas or export points, and/or movements by mode of transportation. Storage restrictions will, however, increase total marketing costs and could influence the type of elevator which is merchandising grain in the surplus grain producing regions.

Total marketing costs, transportation, storage, and the firm receiving and handling costs, varied from $1.8 billion for the 1985 USDA-NIRAP projections to $3.5 billion for the 1990 high grain production estimate (Table 9). Since per unit marketing costs are expressed in the model as constant 1974 dollars, most of the variation in the total marketing costs reflect changes in the total volume of grain that is stored and/or transported from the surplus regions to the deficit regions and to the export points. However, the cost per bushel of surplus grain which is stored and/or transported from the surplus to deficit regions, varies by scenario. For example, the marketing costs varied from $.20 per surplus bushel for the storage scenario to $.30 per surplus bushel for the super port scenario in 1990 (Tables 8 and 9). The variation in costs per bushel of surplus grain depends upon the quantity of grain stored, the directional flow of grain, and the quantity of grain transported by mode of transportation. If, for example, policymakers elect to build super ports, the per bushel marketing costs increased as grain is transshipped from surplus grain regions to the export points. Whether this is an economical option actually depends upon other economic factors (i.e., ocean liner rates, loading rates in the U.S., unloading rates in foreign countries, and international competition) which were not considered in this analysis. Policymakers and/or businessmen who are considering super port options should realize that U.S. transportation and storage costs could increase unless alternative transportation rates and/or new barge routes are incorporated into their plan.

If the USDA-NIRAP projections prevail for 1985, 1990 and 2000, only limited changes will occur in the structure of the U.S. grain industry. Since the 1985 and 1990 grain production, grain surpluses, and grain deficits projections approximate 1980 levels, the existing number and type of grain firms

and the quantity of storage and transportation facilities is adequate to meet the grain industry needs. Most changes which will be made during the next decade will be to replace obsolete equipment and facilities and to better utilize new barges and unit train facilities. The appearances of new drying, storage and/or transportation technologies could alter these conclusions and the resulting implications.

If on the other hand, changes which appeared in the decade of the 1970s reappear in the 1980s, the structure of the U.S. grain industry would change dramatically. Under either the high grain production or baseline scenarios, more U.S. grain firms would be required and more storage and transportation facilities must be provided. Otherwise, grain transportation and storage bottlenecks will become insurmountable barriers which will limit the grain industry's ability to efficiently perform the required marketing functions.

If the public and/or business sectors elect to pursue policies illustrated by increases in the volume of grain stored or exported and/or the introduction of super ports, the grain industry must change rapidly or inefficiencies will appear. For example, the storage policy requires less transportation facilities and a major increase in storage space. If exports were increased dramatically, less storage space will be required; however, more transportation facilities will be needed. In addition, there will be less interregional movement of grain, less grain would be consumed by the domestic livestock industry, the number of feed mills and manufacturers will decrease and the number of grain elevators will increase. This latter conclusion could be offset by a major increase in grain production and the implications would be similar to those for the high grain production scenario. A super port policy will insure a major change in port facilities, will alter the direc-

tional flow of grain and the volume of grain moved by mode of transportation and will increase total marketing costs relative to the baseline scenario.

Since any one of the above scenarios is feasible, each policymaker and/or businessman must carefully evaluate and forecast future trends. This is particularly true for businessmen who are making long-term costly investments in grain facilities. Policymakers should develop long-term consistent policies toward the grain industry. Inconsistent policy decisions create uncertainty which causes a misallocation of resources in the grain industry.

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